



INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS

# Competition Issues in India's Mobile Handset Industry



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## Executive Summary

Mobile phones have been the key to India's technology revolution. India is the second largest mobile phone market globally, next only to China. At the end of 2018, the estimated number of smart phone users in India was 337 million, compared to 2.53 billion users worldwide. One would imagine that the exponential increase in cheaper smart phone models would displace the market for feature phones; to the contrary, feature phones continue to dominate the Indian market. While smart phone and feature phone shipments in 2018Q3 were about the same, a comparison of growth rates shows that both phablets (*large screen smartphones*) and regular smartphones eclipse feature phones.

Mobile phone sales have increased dramatically over the last decade, both in terms of the volume and value. Using data from 2007 to 2018, we find that the compounded annual growth rate (CAGR) of mobile phone sales was 6.66% and 6.54% by volume and value respectively. The average selling price of phones decreased at a CAGR of 0.11% during the same period. Research shows that the smartphone industry boasts of the lowest *Innovation Cycle Time* amongst a host of other industries. The number of years from initiation of R&D to first customer delivery is on average three years for the industry.

At present, the mobile phone market in India is congested with over 75 brands and 3400 models. The market is also very dynamic; the pecking order of firms is constantly changing with new brands challenging established manufacturers. Chinese brands such as Xiaomi, Gionee, Oppo and Vivo are now very prominent in the Indian market, sidelining established domestic brands such as Lava, Intex and Micromax. In 2018, Xiaomi replaced Samsung to become the top player in India by volume. The Government of India viewed the rise of mobile phone users as an opportunity to scale up domestic manufacturing in the country. In April 2017, it notified the Phased Manufacturing Program (PMP) to boost domestic manufacturing through a mix of fiscal incentives. A report in 2017 estimated the possibility for domestic local value addition in mobile phones to rise up to 25.8% by 2019. The

recently implemented National Policy on Electronics (NPE 2019) that will replace the 2012 policy, has set a target of manufacture of 1 billion mobile phones by 2025.

This report focuses on concentration, technological progress, adoption and price points in the mobile handset market in India over a ten-year period between 2008 and 2018. The objective is to examine the extent and nature of competition in the market.

A feature mapping exercise included in this report, finds quality improvements across different price bands of mobile phones, between 2008 and 2018. In order to minimise conflation with factors such as brand, type of phone, etc. we segregated phone models manufactured only by Samsung across 12 price bands for this analysis. Samsung has products across all sub-markets considered in this report. The analysis finds improvements in functionalities across most price bands with the addition of features such as dual SIM, improved wi-fi, GPS and cameras. Comparison of technology and phone types indicates that the market for mobile phone is highly segmented and any competition analysis at the industry level may be subject to qualifications.

Defining the relevant market is central to any competition analysis. There are two fundamental dimensions of the relevant market – product and geography. Since the analysis focuses on India and sub-regional demand data is not available, the market segmentation in this report is based on product categories. We segment the market using three distinct approaches, by price, by technology and by phone type, in addition to an overall analysis of the market.

Price bands are defined based on observable characteristics in the data and expert feedback. Technology generations are exogenously determined, namely 2G, 2.5G, 3G and 4G. The introduction of each generation was a landmark in the technology evolution of the industry. And finally, the third segmentation divides the market into broad product categories, namely, feature

phones, phablets and smartphones. There are however, overlapping trends across different market segmentations. For example, 2G and 2.5G phones generally fall within the lower price bands. Feature phones also fall within the lower price bands.

The competition analysis estimates market concentration ratios for different sub-segments. We also conduct product differentiation and entry-exit analyses to complement findings from the concentration ratios. We use the most widely applied concentration index, the Herfindahl Hirschman Index (HHI) to measure market concentration across different market sub-segments. The HHI values for most market segments are significantly lower in 2018 as compared to 2007. In market segments like phablets, regular smartphones and phones in the 4G category, the secular decline in HHI since 2007 has been very sharp. However, for each of these three segments, HHI has increased from 2016 to 2018. As one would expect, concentration levels are relatively high in the higher price segments. It is vital to emphasise that seller concentration is only a necessary and not sufficient condition for regulatory intervention. Other characteristics such as rivalry, contestability are also crucial.

Since firms gravitate to unequal sizes it makes competition assessments based only on the number of firms, difficult. The reciprocal of HHI, the numbers equivalent (N) accounts for unequal sizes of firms in the market. For example, if a given market has more firms than another, but greater variance in size it is hard to ascertain which market is more competitive. A quantitative analysis using N provides insights into the nature of competition in the market. If there are a large number of firms on the fringes, it could indicate their irrelevance in influencing the degree of active competition.

The estimates for numbers-equivalent and the corresponding number of irrelevant brands is less sanguine than that for HHI. The proportion of irrelevant brands have declined in most segments, although are still relatively high. This has impacted HHIs, which is a measure that uses data for all firms in the relevant market. The number of irrelevant firms implies that the level of effective competition

could be lesser than implied by market structure measures. Policy interventions that empower a larger pool of competitive manufacturers and increase their relevance in the market, will reduce future risk. The academic search for the defining measure of concentration has led to the development of several indicators to complement HHI and to overcome its reported limitations. We use measures such as the K-Concentration Ratio, Horvath Index, Entropy Index, Ginevicius Index and GRS Index to estimate market concentration across the same sub segments. All results point towards adequate and increasing competition across different segments of the industry with the exception of phones belonging in the higher price category. The HHI correlates well with all other measures of concentration estimated in the report.

Product differentiation is an important determinant of market concentration. Economic theory suggests that product differentiation enables firms to establish entry barriers. The estimates for product market differentiation (PMD) find that the degree of product differentiation has increased after the introduction of 4G phones in 2012. Product differentiation increased in the 3G market up until 2016 after which it declined. On the other hand, PMD increased steadily between 2012 and 2018 in the 4G market. However, our overall analysis finds that the 4G market is the least rivalrous among all four technology generations.

Finally, an analysis of entry and exits in the industry finds that an increase in the total number of brands until 2015 was on account of a higher entry compared to the exit rate. From 2016 onwards, the exit rate began to surpass the entry rate, resulting in a decline in the total number of brands. While the entry rate has declined over time, the trend in exit is mixed. The highest exit rate is observed in 2017. Entry and exit could also be a surrogate for expected profits. When expected profitability is high, firms are more likely to enter than exit and vice versa. Hit and run sort of entry has been witnessed in the Indian mobile market and serves the objective of the firm interested in only short term profits. It also helps in disciplining wary incumbents i.e. it lends contestability to the market and helps in pro-competitive outcomes. In India's mobile phone market, there have been instances of

exit from the entire market/ or a particular sub-market within two years of starting operations. This could be a case of undue exuberance on part of the firm or a conscious decision for short run gains. Whatever the reason, competition for the market is good for competition in the market.

Analysis of the composite handset market as well as the various sub-segments reveals two immediate and palpable conclusions. One, measures of competition as reflected in the several overlapping but mutually reinforcing indices reveal significant competition over time and across segments. There is no doubt that the structural estimates vary overtime and of late have shown a tendency to increase especially in segments where consolidation is taking place. Antitrust concerns surrounding this shift however are minimal. The second striking feature of the handset market is the recent domination by Chinese brands. Even during times when Indian brands were enjoying high growth, the extent of value addition within the country was minimal as a large proportion of the components were being imported from China. The last three budgets have tried to incentivise local production by raising duties on imported components. While local value addition has increased slowly it still remains below 20% reflecting in part the efficacy of assembly in India and in part the disability that Indian manufacturing has to contend with.

Consumer preferences have adapted to the constant improvements in mobile technology and handset manufacturing. The demand for sophisticated features has created a virtuous cycle of innovation on the producer side. In this report, we also analyse findings from a primary consumer survey to understand the demand side of the industry and how consumer preferences affect competition in the handset industry in India.

The survey findings indicate that handset choices are driven largely by the technology support they offer and features such as battery life and screen size assume higher importance than price. A recurrent response was the willingness to pay a premium for improvements in the preferred features. While familiarity with functions and improvements in digital literacy may have generated quality-sensitive demand, rapid changes

in technology have also led to shorter replacement cycles of mobile phones, especially among those who can afford it. The survey also finds a willingness to switch to other models and brands for new experiences and features. This also explains the increased product differentiation in the market. Despite these new trends, there is a clear preference for mid-range smartphones, regardless of income levels.

The breadth and depth of the used phones (second hand) market influences demand in the primary market, reflecting the typical characteristics of a durable good. A small percentage of respondents indicated a willingness to buy from the second hand market. The short replacement cycles are probably driving the growth of second hand phones in India. With thriving online market places we expect the volumes to increase in the future.

From a consumer perspective, we do not find any direct evidence of anti-competitive outcomes. The demand and use of mobile phones is becoming ubiquitous especially among the urban youth and the general consumption patterns seem to be maturing with users willing to pay a premium for preferred features. The availability of online resources is reducing information asymmetries in both primary and secondary markets. The neutrality of platforms that provide information, advertise and sell mobile phones has become an important determinant of competitive outcomes.

The mobile industry in India is rapidly evolving. Taking advantage of the low entry and exit barriers, the entry of Chinese brands transformed the domestic handset industry. The mobile handset industry displays healthy competition, with no immediate concern about exercise of market power by any one entity. At the same time a high proportion of irrelevant firms exists that could either grow to be competitive threats in the future or just fall by the wayside. It is essential that policy interventions allow for incentives to develop long term innovation capabilities within the larger set of manufacturers in the industry. Substantive value addition as proposed under the National Electronics Policy (NEP) 2019 will also limit cases of hit and run entry, which are prominent within certain sub-segments. Policies must be developed to support

research capabilities in newer technology generations.

While the industry has seen much progress, both technologically as well as behaviourally, a large part of the population is still to benefit from the use of mobile phones, especially in the light of the push towards digital India. The government has increased its focus on domestic manufacturing of mobile phones, not only to address underpenetration of technology but to limit its reliance on imported technology and imported products.

To encourage domestic manufacturing of mobile phones, India liberalised FDI norms and under the revised policy, foreign investment in manufacturing will be automatically approved. Budget 2018-19 increased customs duties on specific mobile components. However, significant investments will be required to develop the necessary infrastructure to support domestic manufacturing of components and spare parts in the future. India's experience with import substitution policies that prevailed in the decades before liberalisation was inimical to fostering industrialization. On the other hand, Japan and Korea have demonstrated that industrial policies with sunset clauses can have pro industrialisation impacts. It must be recognized that protectionist measures are a double edged sword.

Economies of scale and the presence of a mature ecosystem, continue to enable the low cost of

production for mobile phones in China. Even though several contract manufacturers from Taiwan, Korea and China are considering India, the feasibility of manufacturing core components such as chipsets remain distant. The government must undertake measures to develop adequate infrastructure and policy incentives to progressively transform India into a large scale manufacturing ecosystem. In this respect Vietnam has stolen by a march by offering lower tax rates, comparable wage rates and lower overall costs of doing business. The advantage of a large market size that India has and will continue to possess, is often offset by these disability costs.

NITI Aayog has set up a committee on how to jump-start India's exports of mobile phones in particular and electronics in general. The committee was created in the backdrop of the failure of India's phased-manufacturing-programme (PMP) for mobiles. The objective is not to alienate foreign manufacturers, but to build domestic capability that will enable sustainable growth with the added benefit of local job creation. Also in this context, India must seriously evaluate the need to host a semi-conductor fabrication unit. India's potential lies in addressing the under-served demand of nearly half a billion people, and the constant need for up gradation from the other half. Collaborative steps by the government and industry can help build domestic capacity while maintaining healthy levels of competition.

# 1. Introduction and Background

Telecom and information technology have transformed the way we live. Mobile phones have been the key to this revolution in India. It is now the second largest smart phone market globally. In 2010, UN reported a tragic irony - India had more mobile phones than toilets<sup>1</sup>. While the access to household toilets has risen sharply<sup>2</sup>, the euphoria around mobile phones hasn't withered either. At the end of 2018, the estimated number of smart phone users in India was 337 million, compared to 2.53 billion users worldwide<sup>3</sup>. One would imagine that the exponential increase in cheaper smart phone models would displace the market for feature phones. To the contrary, feature phones continue to dominate the Indian market, with over 50 percent share<sup>4</sup> (by volume), driven by a preference among users in small towns who find little value to buy smart phones. In 2017 Reliance introduced the 4G enabled Jio feature phone. Cheaper feature phones with 4G capabilities that allow users to access the Internet have slowed down the adoption of smart phones, particularly among price sensitive consumers, who dominate rural and semi urban markets. While smart phone and feature phone sales in Q3 2018 registered equal number of shipments, in a comparison of growth rates, sale of both phablets and regular smart phones have clearly outcompeted feature phones. Phablets<sup>5</sup> entered the market in 2012 and have grown at a compounded annual growth rate (CAGR) of 137.98 percent during the period 2012 to 2018; the corresponding number for regular smart phones is 18.91 percent during the period 2007 to 2018, while that of feature phones stood at a meager 0.74 percent. The difference is higher if we take growth in sales by value. As the base effect diminishes, growth rates for sale of phablets and regular smart phones are also likely to moderate.

At present, the mobile phone market in India is overcrowded with over 75 brands and 3400 models<sup>6</sup>. 2G and 2.5G mobile phones are largely manufactured by relatively unknown brands. These are phones that fall within the less than Rs 2500 price range. This market is also very dynamic; the pecking order of firms is constantly changing with new brands challenging established manufacturers.

Chinese brands such as Xiaomi, Gionee, Oppo and Vivo are now very prominent in the Indian market, overthrowing established domestic brands such as Lava, Intex and Micromax. In 2018, Xiaomi replaced Samsung to become the top player in India. Domestic brands were handicapped by their inability to manufacture locally and reached out to design manufacturers in China. Retail distributors who understood the industry supply chain also launched local, fly by night brands of mobile phones like Kool, Sunny and Vijay<sup>7</sup>. In November 2016, a report by Counterpoint Research and IIM Bangalore estimated the local value addition in mobile phone manufacturing to be just under 6%<sup>8</sup>. The Government in India viewed the rise of mobile phone users as an opportunity to scale up domestic manufacturing in the country. In April 2017, it notified the Phased Manufacturing Program (PMP) to boost domestic manufacturing through a mix of fiscal incentives. A report in 2017 estimated the possibility for domestic local value addition in mobile phones to rise up to 25.8% by 2019<sup>9</sup>. This study also reported that 4G smart phones available at less than Rs 4500 offer very poor user experience. It recommended the minimum specifications of a smart phone, the estimated price for which would be Rs. 8500. This is a challenge for policy that seeks to achieve the twin objectives of affordability and digital ubiquity. The recently implemented National Policy on Electronics (NPE 2019) that replaced the 2012 policy has set a target of manufacturing 1 billion mobile phones by 2025<sup>10</sup>.

In this report we take a close look at the evolution of the mobile handset market in India. We will chart the transformation of the industry through technological progress, usage and price of mobile phones in India, with the objective to identify competition issues. We will also review the policies for local value addition and provide recommendations that are best suited for driving the competitiveness of India's domestic industry, given the demands of its digital future. In the following sections of the introduction we trace the history of the industry with a focus on the rise of domestic brands. We will also highlight challenges related to domestic manufacturing. The second

section will focus on competition analysis including an overview of the market structure, technological advancements, estimation of concentration ratios and an entry – exit analysis. The third section will present survey findings of consumer data collected through an online platform on, prices, user preferences, lock-ins etc. The final section concludes and offers policy recommendations.

## 1.1 The Rise of India's Mobile Handset Industry

In 1994, the waiting list to get a telephone installed in India was four years, and the number on that list was two million.<sup>11</sup> By 2018, India had over a billion mobile subscribers<sup>12</sup> and monthly sales of mobile phones averaged 10 million units.<sup>13</sup> Nokia, Motorola and Ericsson - the fashionable brands in the early-2000s thrived on the quality of their built-in camera, radio and music applications. The dual SIM technology patented by Siemens in the 1990s also lifted demand from 2010, as a large number of mobile users preferred the convenience to switch between service providers to take advantage of the best deals or when coverage was patchy. Some also preferred to separate their personal and professional calls<sup>14</sup>. In 2009, Taiwanese manufacturer HTC launched India's first Android based smart phone. This was around the time Blackberry had successfully positioned itself as the ultimate smart phone, thriving on the success of its instant messaging app, BBM. Before Apple's iPhone arrived, Android prototypes were cheap clones of the Blackberry<sup>15</sup>. With the mobile industry moving towards bigger touch screen displays, Android steadily captured market share in India. With the decline of Symbian, the operating system used on Nokia phones, Android established dominance in the Indian market and Apple captured a niche. As of 2018Q2, Android held 84 percent of the mobile operating system market in India.<sup>16</sup> More recently, the online-exclusive brands like Xiaomi, Honor, OnePlus etc. have disrupted the market. Online channels contributed to 42.2 percent of total sales in 2018Q4, driving the overall growth of smart phone sales in India.<sup>17</sup> Unsurprisingly, these brands are among the top 8 in the Indian market since 2017<sup>18</sup>. Contemporaneously Nokia phones have also resurfaced after HMD Global acquired rights to sell their phones. In May 2017, Nokia's classic 3310 was re-launched with a vastly improved battery life, a

camera and a colour screen. While, there are several traditional users who would discard modern technology to return to the days of text messages, polyphonic ringtones and *Snake*, there is skepticism around Nokia's ability to compete with smart phone juggernauts such as Xiaomi, Samsung and Apple. The inherent networks effect of the digital industry also limits that possibility. Regardless, India's love affair with the mobile is here to stay. With mobile as the future of everything, it is estimated that smart phone users alone will touch 442.5 million<sup>19</sup> by 2022 making India a very seductive smart phone market.

### 1.1.1 The Rise (and fall) of Domestic Brands

An interesting milestone in the development of India's mobile handset market has been the rise of domestic brands such as Micromax, Spice, Lava and Karbonn. These were companies that served as distribution channels for Nokia, Motorola, Sony Ericsson, LG and others, who forayed into manufacturing. They partnered with design and manufacturers in China, a phenomenon popularly referred to as the white-labelling deal<sup>20</sup>. The differential duty structure was among the primary drivers that stimulated investments in domestic assembly. The market was flooded with cheap smart phones made available by domestic companies that looked identical to existing foreign brands and similar in hardware and software capabilities. *Table 1.1* below traces the record of top 8 mobile phone brands in the Indian market. The rise of domestic brands began in 2009. 2015 was another turning point; domestic brands were being challenged by Chinese Original Equipment Manufacturers (OEM) such as Oppo, Vivo, Xiaomi and Gionee. Based on market intelligence, the Chinese brands were able to produce more variety, offer healthier margins and create better marketing campaigns compared to their Indian counterparts. Some brands sold exclusively online, using *hunger marketing* strategies to enhance product desirability. 2018 recorded the highest ever smart phone shipments in a year, in India, with a total shipment of 142.3 million devices.<sup>21</sup> In 2018Q4, Xiaomi led the market in units sold with a market share of 28.9 percent, followed by Samsung and Vivo.<sup>22</sup> Several reasons explain fall of domestic brands including the lack of innovation and R&D capabilities. Samsung has maintained its steady



position as a market leader, by value, during this battle for dominance between Indian and Chinese

mobile phone manufacturers.

**Table 1.1: Top 8 Brands (Market share by Value) in India's Mobile Handset Industry**

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Nokia	Nokia	Nokia	Nokia	Nokia	Samsung	Samsung	Samsung	Samsung	Samsung	Samsung	Samsung
Sony Ericsson	Samsung	Samsung	Samsung	Samsung	Nokia	Nokia	Micromax	Micromax	Apple	Xiaomi	Xiaomi
Motorola	Sony Ericsson	LG Electronics	G-Five	G-Five	Micromax	Micromax	Nokia	Apple	Oppo	Vivo	Vivo
Samsung	LG Electronics	Micromax	Micromax	Micromax	Karbons	Karbons	Apple	Intex	Xiaomi	Apple	Oppo
LG Electronics	Motorola	Sony Ericsson	LG Electronics	Blackberry	Apple	Sony	Karbons	Lava	Micromax	Oppo	Lyf
Classic	Spice	Spice	Blackberry	HTC	HTC	Apple	Sony	Lenovo	Lenovo	Motorola	Apple
Huawei	Huawei	G-Five	Spice	Karbons	Blackberry	Lava	Lava	HTC	Vivo	Micromax	OnePlus
Spice	Vodafone	Karbons	Maxx	Spice	Sony	Intex	Motorola	Motorola	Lyf	Lenovo	Nokia

Source: IDC's Quarterly Mobile Phone Tracker, 2018Q2

The government push for Make in India will alter the market, as will technological change and evolving consumer preferences. Companies that are able to anticipate better are likely to grow faster. Indian brands have also seen a comeback in 2017. New models launched by Jio, Micromax and Lava are strategically targeted in specific price bands. Domestic companies are also investing in R&D with a hope to regain market share. A key to the success of Indian brands will also depend on their marketing strategy, including the choice and balance between online and offline selling.

## 1.2 Domestic Manufacturing and Local Value Addition

Despite the rise of domestic mobile phone brands, the question that continues to bedevil analysis is the extent to which these phones are made in India. Two recent reports<sup>23</sup> offer insights. While India successfully manufactures some non-electronic components and accessories, and runs the assembly and testing processes, high-end electronic components are imported as completely built units (CBU). According to IAMAI and Enixta (2017) the battery pack is likely to see improved local value addition at 63.7%, followed by camera and display

at 49.6% and 41.8% respectively by 2019.

Undoubtedly this requires policy perseverance, especially with respect to investment in research and design, practical skill training and ease of doing business. The imposition of the Basic Custom Duty at 10% on import of mobile phones and specified components (since July 2017), reinforces the Government's intent to indigenize manufacturing of mobile phones, as it helps maintain the duty differential regime even after the implementation of the Goods and Service Tax (GST).

The Phased Manufacturing Plan (PMP) has also encouraged many domestic and foreign players to build capacity in India. Taiwan's contract manufacturing companies - Foxconn and Wistron have built multiple plants in the country to manufacture and assemble mobile phones. While expansion is undisputed, companies have reported several legal and political roadblocks in scaling up units and developing a vendor ecosystem. For example, provision of power, water and an affordable line of credit add to India's costs. The overall cost of manufacturing in India is estimated to be higher than in other Asian countries (Refer Figure 1.1).

**Figure 1.1: Labour Cost and Business Environment in Select Countries**



Source: Compiled by authors from 'Asia in 2025 – Development prospects and challenges for middle-income countries', ODI (September 2018)

With the exception of a huge market base, the ecosystem currently lacks a compelling reason for foreign manufacturers to build capacity in India. With nothing to tie them down, these new facilities will be quickly uprooted and re-established in other countries where costs of manufacturing are lower. Building domestic competitiveness in an industry which has been heavily reliant on imports for decades is undoubtedly hard. The NPE 2019 will lead to formulation of several schemes, initiatives, projects, etc., in consultation with the concerned Ministries/ Departments, for the development of ESDM sector in the country. It will enable flow of investment and technology, leading to higher value addition in the domestically manufactured electronic products, including mobile phones.

Samsung has recently invested Rs. 500 crore to add capacity, and domestic firms such as Micromax and Lava, among several others are also upgrading their facilities<sup>24</sup>. According to a report by CyberMedia Research, over 150 mobile handset manufacturing units have been set up in India over the past four years.<sup>25</sup> The report also found that Completely

Knocked Down (CKD)<sup>26</sup> manufacturing units stood at 57 percent while Semi Knocked Down (SKD)<sup>27</sup> manufacturing units stood at 39 percent at the end of 2018Q4.<sup>28</sup>

This study analyzes competition in India's mobile handset industry and identifies trends that affect its growth in the future. The analysis detailed in Section 2, shows that competition in India's mobile handset industry has steadily increased over the past decade, with low barriers to entry and new brands flooding the Indian market. Based on findings of our primary survey in Section 3, which found consumers' willingness to pay for improved features and user experience, there is continuous innovation in horizontal features of mobile phones. With India's mobile handset industry displaying such robust competition, it is essential that policies incentivize innovation and promote domestic manufacturing to allow Indian firms to capture more value from the mobile industry moving forward. The report provides some policy recommendations and sets the ground for further discussion.



## 2. Competition Analysis

Technology has been the driver for mobile manufacturing globally but India has the added benefit of market size that few other countries can claim. Add to this the government's focus on scaling up domestic manufacturing and the opportunity is alluring. Both domestic and foreign firms have unsurprisingly increased their investments in India.

Time is thus ripe to analyse the forces of competition in this industry and identify interventions that can catalyse its growth. The number of new mobile phones has increased remarkably over time, also due to the entry of new companies which were not traditionally telecom. Moreover, the quality of mobile phones has considerably improved over time with the continuous introduction of new functionalities both on hardware and software. An interesting fact that underlines the growth and innovation strategies of the two global leaders in smartphone design and sales – Samsung and Apple – is that, while Samsung was far ahead in terms of new products launched, Apple's approach was more measured with only 6 new products. A lack of a clear dominant design in the global smartphone market is thus not due to the technical progress but prominently because of individual firms' strategies<sup>29</sup>.

In the Indian market mobile phone sales have increased dramatically over the last decade, both in terms of the volume and value. Using data from 2007 to 2018, we find that the compounded annual growth rate (CAGR) of mobile sales was 6.66% and 6.54% by volume and value respectively. In comparison the average selling price of phones decreased at a CAGR of 0.11%. Research shows smartphones to be an industry which sees the lowest *Innovation Cycle Time* amongst a host of other industries. The number of years from initiation of R&D to first customer delivery is on average three years for the industry<sup>30</sup>.

We ran a technology feature mapping across different price bands of mobile phones between 2008 and 2018. In order to minimise conflation with factors such as brand, type of phone, etc. we segregated phone models manufactured only by

Samsung across 12 price bands<sup>31</sup>. Samsung has products across all sub-markets considered in this report. We compared different features of mobile phones such as operating systems, processor speed, resolution, battery life etc. to understand technology evolution in mobile phone manufacturing and its impact on price. In 2008, some feature phones manufactured by Samsung were priced in the \$300 - \$400 and \$400 - \$500 range. These phones were touch screen and 3G enabled. In 2018, an ultra-low end Samsung smartphone was available in the \$75 - \$100 price band that had 4G capability, provided a significantly higher internal storage space, higher resolution camera and touch screen input that was better than any other Samsung phone available in that price band in 2008. In the higher price bands i.e. \$500 - \$700 and > \$700, phones were available both in 2008 and 2018. However, the models in 2018 had higher camera resolution, bigger screen sizes and better specifications overall. A shift is seen in the input method – while the high and ultra-high-end phones mostly used QWERTY plus touch screen or alphanumeric input methods in 2008, the models in 2018 were all touch screen with bigger screen sizes. The phones in 2018 in the higher price bands were also mostly dual SIM phones. The feature mapping exercise finds improvements in functionalities across most price bands with the addition of dual SIM, improved wi-fi, GPS and camera. Details of the mapping are available in *Appendix 1* of this report.

This analysis also led us to conclude that the market for mobile phones is highly segmented and any competition analysis at the industry level may be subject to qualifications. Defining the relevant market is central to any competition analysis. There are two fundamental dimensions of the relevant market – product and geography. Since the analysis is focused on India and sub-regional demand data is not available, the market segmentation in this report is based on product categories.

### 2.1 Dissecting the Market for Mobile Handsets

As opposed to general regulatory analysis using prospective (ex-ante) definitions for a market,

competition authorities often look backwards (ex-post) to define a relevant market. Relevant markets defined in terms of products are considered to be *sufficiently substitutable* by users and *sufficiently similar* from the perspective of suppliers. Mobile phone models vary significantly in price, technology and functionality and therefore cannot be clubbed as one market. For the purpose of this study we segment the market using three distinct approaches, in addition to an overall analysis of the market.

The first approach segments the market using different price bands. We used histograms on the data for mobile phones sales from 2007 to 2018 to divide the market by 12 price bands. These are - <\$25, \$25 - \$75, \$75 - \$100, \$100 - \$125, \$125 - \$150, \$150 - \$175, \$175 - \$200, \$200 - \$300, \$300 - \$400, \$400 - \$500, \$500 - \$700, >\$700. The second segmentation is based on technology generations, namely 2G, 2.5G, 3G and 4G. The introduction of each generation was a landmark in the technology evolution of the industry. The third segmentation is the broadest, dividing the market into product categories, namely, feature phones, phablets and smartphones.<sup>32</sup> There are however, overlapping trends across different market segmentations. For

example, 2G and 2.5G phones generally fall within the lower price bands. Feature phones also fall within the lower price bands. The first batch of lower end smartphones, priced at less than \$25 was sold in India in 2015. *Table 2.1* provides the annual change in average selling price (ASP) of feature phones, phablets and regular smartphones over the period 2007 to 2018. While feature phone prices have declined from 2008 to 2016, an increase can be seen from 2017, up until 2018. The ASP for phablets has declined over time, except for an upward spike in 2017. The trend for regular smartphones is mixed, with an increasing trend until 2009, and a decreasing trend thereafter. A common observation is the increase in ASP, across all product categories, in 2017. One explanation is the imposition of a Special Additional Duty (SAD) of 2% on printed circuit boards (PCBs) as proposed in the Budget 2017-18.<sup>33</sup> PCBs account for about 40% - 50% of the value of a mobile phone<sup>34</sup> and a duty on it could significantly increase the manufacturing cost. The same analysis by technology generation finds a decline across all generations, except for the ASP of 2G phones in 2014 (Refer *Table 2.2*). The rate of decline, however, fluctuates year-on-year across technology type.

**Table 2.1: Annual Changes in Average Selling Price for Feature Phones, Phablets and Regular Smartphones**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Feature Phone	8.60%	-26.09%	5.86%	-11.72%	-27.20%	-9.96%	-18.84%	-19.74%	-14.36%	2.31%	4.03%
Phablet						-20.61%	-41.68%	-16.63%	-15.08%	10.62%	-5.03%
Regular Smart Phone	8.13%	9.39%	-27.10%	4.14%	-13.62%	-25.33%	-20.87%	-10.96%	-2.79%	6.95%	-13.55%

Source: IDC's Quarterly Mobile Phone Tracker, 2018Q2

**Table 2.2: Annual Changes in Average Selling Price for 2G, 2.5G, 3G and 4G Phones**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2G	-16.01%	-20.20%	-0.13%	-3.26%	-19.63%	-12.70%	14.42%	-10.27%	-22.39%	3.54%	-0.45%
2.5G	-3.20%	-21.73%	-2.27%	-15.34%	-29.50%	-0.68%	-7.25%	-30.83%	-15.58%	-2.71%	-4.90%
3G	-7.82%	7.58%	-25.50%	-14.84%	-4.38%	-0.83%	-19.72%	-35.02%	-34.29%	-11.71%	-20.44%
4G						-28.21%	-26.76%	-48.05%	-23.36%	-10.20%	-26.76%

Source: IDC's Quarterly Mobile Phone Tracker, 2018Q2

The next series of tables (2.3 to 2.5) provide data on the number of mobile phone brands present within

each category. While the overall number of brands has increased in the market, there is also a shift

towards the manufacture of new generation phablets and smartphones. The number of brands present in the lower price bands has also fallen from their peak in 2014. However, the \$75 - \$100

price range has seen the highest number of entrants. The market for high-end phones, priced at over \$700 is relatively concentrated with only 5 brands, as of 2018Q2.

**Table 2.3: Number of Brands Manufacturing Across Technology Generations**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2G	12	13	15	25	21	27	27	33	26	23	20	14
2.5G	24	28	34	32	35	37	35	37	32	25	21	17
3G	9	14	15	19	20	30	32	45	43	32	20	5
4G						3	7	14	40	44	50	42

Source: IDC's Quarterly Mobile Phone Tracker, 2018Q2

**Table 2.4: Number of Brands Manufacturing Across Different Price Bands**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
\$0 - \$25	6	11	13	15	25	31	33	36	27	26	22	17
\$25 - \$75	15	19	25	30	32	35	31	35	37	30	31	24
\$75 - \$100	10	16	22	23	20	18	25	31	36	33	35	26
\$100 - \$125	9	13	13	16	14	14	24	29	32	32	35	25
\$125 - \$150	8	10	14	11	11	15	25	24	30	24	25	21
\$150 - \$175	7	12	10	8	11	16	20	24	24	26	25	16
\$175 - \$200	5	11	9	6	9	10	14	21	22	19	22	16
\$200 - \$300	10	12	11	12	14	15	18	25	25	22	24	17
\$300 - \$400	12	14	14	14	11	11	11	16	17	16	13	10
\$400 - \$500	12	12	9	10	10	8	9	13	12	10	9	7
\$500 - \$700	11	13	11	10	10	7	8	9	9	10	10	8
> \$700	7	9	4	3	1	3	6	6	7	8	5	5

Source: IDC's Quarterly Mobile Phone Tracker, 2018Q2

**Table 2.5: Number of Brands Manufacturing Feature Phones, Phablets and Regular Smartphones**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Feature Phone	17	20	28	31	35	37	34	36	29	26	23	18
Phablet						2	11	24	36	42	42	34
Regular Smart Phone	13	16	17	18	20	32	34	43	51	45	47	36

Source: IDC's Quarterly Mobile Phone Tracker, 2018Q2

We use this background on the mobile phone industry to develop competition analysis in the following sub-sections. The entire analysis is based on data collected and disseminated by IDC through their Quarterly Mobile Phone Tracker<sup>35</sup> for the period 2007 to 2018Q2.<sup>36</sup> IDC uses a bottom-up

methodology to deliver an accurate view of mobile phone markets across different countries. This report is restricted to data for India.<sup>37</sup>

## 2.2 Market Structure Analysis – Market Concentration, Product Differentiation and Barriers to Entry

Market concentration measures the extent to which sales in a market are dominated by one or more businesses. It is a key component of market structure analysis along with product differentiation and barriers to entry. Economic theory suggests that, other things being equal, firms with significant market positions in highly concentrated markets will tend to restrain output, increase prices and retard competitive efforts of other firms unless the market is contestable. Significant resource concentration and large firm sizes are believed to confer market power<sup>38</sup>.

The level of competition in a market can vary between perfect competition (minimum concentration) and monopoly (maximum concentration). Concentration measures offer a simple way to measure the competition level in any market within these two extremes. It is also used as an input for market regulation.

The mobile manufacturing market possesses at least three distinguishing characteristics that are relevant for competition analysis (i) products are differentiated (ii) a few relatively large suppliers exist but the market place is crowded at the lower end (iii) the rate of innovation is high. These features suggest that firms may not simply be the price takers of the perfectly competitive model. Consumer preference for a specific brand confers some degree of market power on firms, and competition is thus imperfect. Market power is the ability to profitably raise price above marginal cost, reflecting, on the demand side, a premium that consumers are willing to pay for variety.

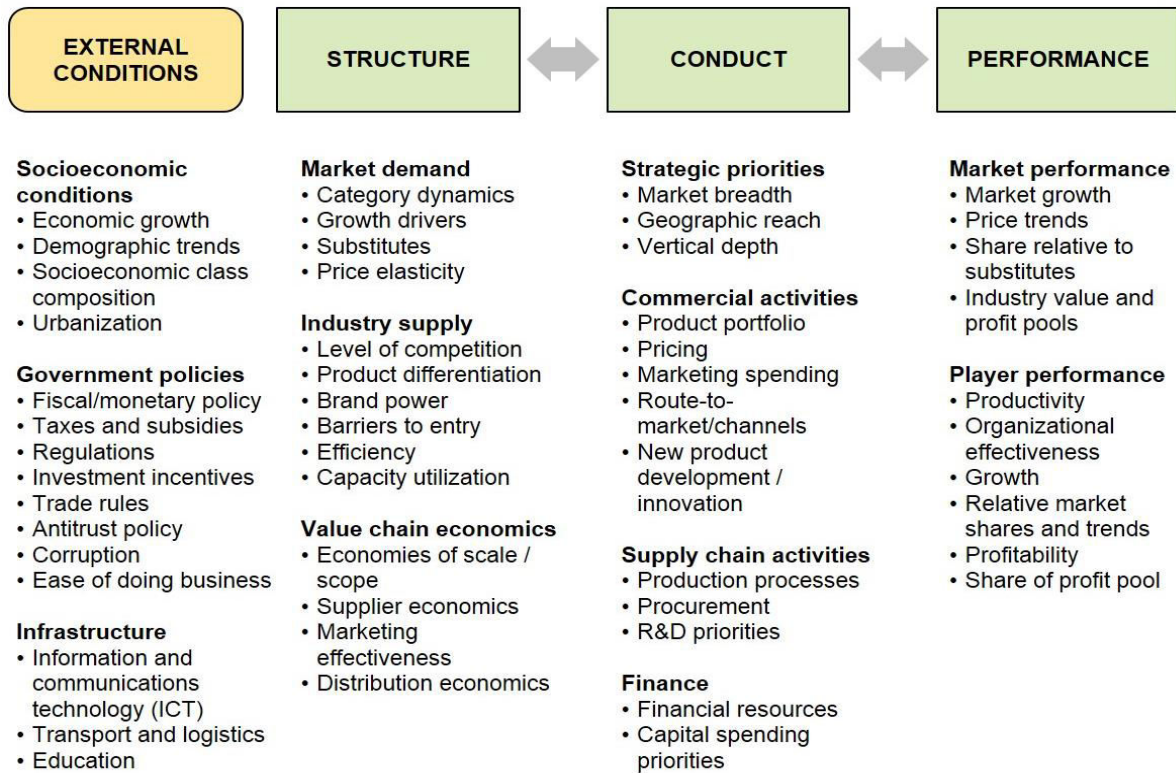
The traditional approach to assessing market power in the industrial organization literature is the Structure-Conduct-Performance paradigm (SCP). The S-C-P approach assumes a stable, causal relationship between the structure of an industry, firm conduct, and market performance as measured

by economic profits. The set of observable structural variables are measures of seller concentration and barriers to entry and the line of causality is envisaged to run from structure through conduct to performance or the exercise of market power. The implication is that concentration facilitates the exercise of market power.

In contrast to this industry approach to conduct and performance, one can envisage an alternative approach that makes the firm the centerpiece of analysis. Firms differentiate their products and differ in their organization form and internal efficiency.<sup>39</sup> It is the drive to be different that unleashes dynamic competition of the Schumpeterian type. This firm approach reverses the link between structure and conduct and performance; it is firm-specific efficiency advantages that determine how large a firm becomes and therefore industry concentration. Thus, more efficient companies with superior products grow to be larger than other firms.<sup>40</sup> The New Empirical Industrial Organization (NEIO) places more emphasis on firm specific attributes. In case these are the source of high market shares, the relation between structure and market power must be nuanced. America's soft-drink industry, to take one example, is noted for price competition although only two firms, Coca-Cola and PepsiCo, control three-quarters of sales. The reason the two firms enjoy high market share is because of product preference and quality rather than structural attributes of the industry.

In our present exercise the focus is on a single mobile industry and not the traditional inter-industry comparisons of performance and conduct of firms within those industries. The SCP paradigm uses market concentration as a basis to analyse market structure. The SCP framework was developed by Bain in 1959<sup>41</sup> and enriched by others over time, and it emphasizes the extent to which concentration elevates price above minimum average cost<sup>42</sup>. The SCP framework is illustrated in *Figure 2.1* below

Figure 2.1: Structure – Conduct – Performance Framework



Source: Canback <https://www.canback.com/news3/scp/>

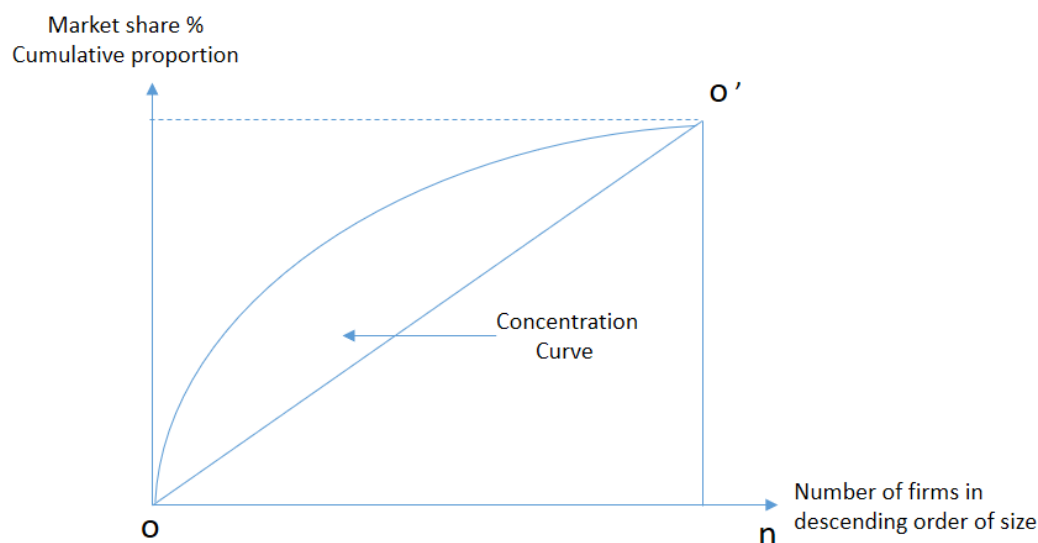
To the best of our knowledge this is the first systematic study to analyse market concentration and consequently, market structure in India's mobile handset industry. In the following subsections we estimate and compare different market concentration ratios for the industry. We also follow up with a product differentiation and entry- exit analysis to complement the findings from concentration ratios.

### 2.2.1 Market Concentration: HHI & Numbers Equivalent

Market concentration measures indicate the number and relative size distribution of sellers in a

market. Markets that consist of numerous sellers with approximately equal shares are less concentrated than markets with few sellers controlling disproportionate shares of market output<sup>43</sup>. Concentration measures are related to the concentration curve where cumulative proportionate market shares of the firms are plotted on the Y axis and the number of firms from the largest to the smallest on the X axis. The concentration curve is represented in Figure 2.2, and is almost similar to the Lorenz curve that measures the degree of inequality in distribution of income<sup>44</sup>.

**Figure 2.2: Concentration Curve**



Source: Adapted from Barthwal 2007

From a usability perspective, concentration indices should be easy to compute, independent of the market size and easy to interpret along the continuum of perfect competition to monopoly.

The most widely applied concentration index is the Herfindahl–Hirschman Index (HHI). Measured using the formula  $H = \sum_{i=1}^N s_i^2$  where  $s_i$  is the market share of firm  $i$  and  $N$  is the number of firms. While it takes into account all firms in the industry, it assigns greater weight to the larger sized firms in an industry. HHI varies between a lower limit of 0 and 1 (Monopoly) and the closer it is to 1, the more concentrated the industry. If there are  $N$  equal-sized firms, then  $HHI = 1/N$ . The inverse of HHI,  $1/HHI$  is the equivalent number of equal-sized firms in the

market that results in the same HHI. HHI is also equal to

$$HHI = \frac{1}{N} + N\sigma^2$$

where  $\sigma^2$  is the variance of firm size. This indicates that changes in HHI arise from changes in the absolute number of firms *and* the size distribution of firms. The larger the variance of firm sizes – indicating a wider distribution of firm sizes around the mean – the larger the HHI. If market shares are measured in percentages, then the HHI is scaled by 10,000. We calculate HHI for the overall mobile handset industry in India and various segments defined in the sections above. The results are presented in *Table 2.6*.

**Table 2.6: Year-wise HHI Estimations for Different Market Segments**

Market Segment		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HHI for overall industry		0.34	0.40	0.32	0.16	0.19	0.20	0.18	0.13	0.14	0.12	0.13	0.16
HHI by generations	2G	0.64	0.61	0.67	0.48	0.49	0.27	0.22	0.22	0.30	0.19	0.20	0.21
	2.5G	0.24	0.32	0.22	0.14	0.17	0.17	0.15	0.13	0.13	0.15	0.20	0.19
	3G	0.71	0.61	0.52	0.27	0.24	0.30	0.26	0.15	0.11	0.11	0.17	0.41
	4G						0.90	0.31	0.26	0.23	0.14	0.14	0.17
HHI by phone type	Feature Phone	0.29	0.38	0.29	0.15	0.20	0.20	0.19	0.16	0.15	0.16	0.16	0.32
	Phablet						0.99	0.73	0.13	0.20	0.16	0.18	0.23
	Regular Smart Phone	0.70	0.56	0.59	0.38	0.22	0.26	0.20	0.15	0.14	0.12	0.11	0.13
HHI by price bands	< \$25	0.71	0.17	0.17	0.32	0.20	0.07	0.09	0.11	0.13	0.14	0.13	0.35
	\$25 - \$75	0.35	0.38	0.28	0.14	0.15	0.22	0.18	0.17	0.13	0.11	0.11	0.18
	\$75 - \$100	0.30	0.43	0.46	0.16	0.38	0.36	0.25	0.16	0.18	0.09	0.23	0.28
	\$100 - \$125	0.34	0.60	0.41	0.34	0.44	0.49	0.22	0.14	0.16	0.23	0.14	0.22
	\$125 - \$150	0.43	0.34	0.38	0.39	0.31	0.18	0.15	0.26	0.16	0.18	0.15	0.17
	\$150 - \$175	0.39	0.41	0.25	0.42	0.38	0.18	0.31	0.18	0.18	0.17	0.25	0.23
	\$175 - \$200	0.36	0.53	0.32	0.42	0.26	0.46	0.27	0.21	0.17	0.29	0.35	0.26
	\$200 - \$300	0.53	0.45	0.38	0.31	0.22	0.17	0.36	0.22	0.28	0.18	0.23	0.32
	\$300 - \$400	0.30	0.40	0.78	0.33	0.29	0.30	0.31	0.24	0.20	0.19	0.21	0.30
	\$400 - \$500	0.36	0.49	0.29	0.22	0.25	0.28	0.63	0.18	0.53	0.67	0.35	0.52
	\$500 - \$700	0.39	0.26	0.28	0.29	0.19	0.69	0.22	0.36	0.36	0.43	0.48	0.32
	> \$700	0.55	0.33	0.34	0.43	1.00	0.94	0.32	0.54	0.52	0.69	0.52	0.64

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

The HHI values for most market segments are significantly lower in 2018 as compared to 2007. However, while HHI values have declined from 2007 to 2015, there has been a minor increase in concentration thereafter. The number of manufacturing brands in all market segments has also declined, reflecting churn. In market segments like phablets, regular smartphones and phones in the 4G category, the secular decline in HHI since 2007 has been very sharp. However, for each of these three segments, HHI has increased from 2016 to 2018. As one would expect, concentration levels are relatively high in the higher price segments i.e. \$400 - \$500, \$500 - \$700 and > \$700. HHI estimates

below 0.10 (1000) are indicative of highly competitive markets, and those falling between 0.10 and 0.20 (1000 and 2000) indicate no adverse effects of competition. Values above 0.20 (2000) can become a matter of concern and may require regulatory attention<sup>45</sup>. It is vital to emphasise that seller concentration is only a necessary and not sufficient condition for regulatory intervention. Other characteristics such as rivalry, contestability are also crucial. And usually the assumption that buyers are unconcentrated is reasonable. However, buyer concentration may well make it difficult for sellers to exercise market power.



In 2018, the segments 3G, feature phones, and all price bands except \$25 - \$75 and \$125 - \$150, have HHI values above 0.20, indicating concentration. In particular, all mobile phone categories priced above \$400 report very high HHIs. The limited number of manufacturers for phones over \$400, results in high values of HHI. In 2018, phones priced over \$700 comprised 0.86% of the total market by volume but 10.16% of the total market share by value. All phones sold over \$400 comprised only 1.51% of the total market share by volume, but 14.59% by value. Chinese brands – Xiaomi, Oppo, Vivo are rapidly expanding their market shares as smaller brands are unable to compete on quality, functionality and variety.<sup>46</sup> There is a rise in the HHI for 3G phones, perhaps driven by the leapfrogging from 2G to cheap 4G phones, reducing the demand for 3G and consequently the number of 3G suppliers.

Adelman (1961), argued that since firms gravitate to unequal sizes it makes competition assessments based only on the number of firms difficult<sup>47</sup>. For example, if a given market has more firms than another, but greater variance in size it is hard to ascertain which market is more competitive. He proposed the *numbers – equivalent (N)*, the reciprocal of HHI as a guide (see above). According to Adelman, while the real structure of the industry consists of much more than its size distribution, the measure N is closer to the ultimate (and unknowable) truth than a vague cloud of a dozen or a hundred firms who are "in the market" but may or may not count for anything.

Despite being a reasonable indicator of market concentration, the numbers-equivalent by itself is not adequate. As the numbers- equivalent increases, and the industry moves from monopoly towards either oligopoly or monopolistic competition, it becomes challenging to identify the threshold that indicate a change in market structure. Horowitz<sup>48</sup> in an analysis of the Numbers

Equivalent in US manufacturing industries had defined some thresholds. For instance, an industry consisting of less than 10 firms, has been categorised as a "tight oligopoly". The "Rule of Three" suggests that market forces can predict the evolution of competitive industries<sup>49</sup>. In an industry's early stages of growth, there are several competitors. However, as the industry matures, three firms that adapt better, survive and thrive in the market with a total market share of 70-90%. While there are several examples from other countries, the telecom services industry in India has also demonstrated this phenomenon; from a hypercompetitive market with almost 15 service providers, the industry now comprises of 4 players that command over 97 percent of the market share<sup>50</sup>. The unviable firms are gradually weeded out by market forces.

A quantitative analysis using 'N' provides insights into the nature of competition in the market. If there are a large number of firms on the fringes, it could indicate their irrelevance in influencing the degree of active competition. Thus, we define:

$$\text{Irrelevant Firms (IR)} = \text{Actual Number of Firms in the Industry} - N \dots\dots\dots (1)$$

$$\text{Proportion of Irrelevant Firms (IRp)} = \text{IR} / \text{Total Number of Firms} \dots\dots\dots (2)$$

While an increase in the number of players in the market can give the notion of increased competition, if the increase does not lead to significant changes in market shares then the level of competition remains unaffected. We calculate N, IR and IRp for different segments of the mobile industry in India<sup>51</sup>. Results for the overall industry and feature phone/ smart phone categories are provided in Table 2.7 below. Table 2.8 captures the detail on the segmentation by technology generations. The results for the price segments are available in *Appendix 2*.



**Table 2.7: Estimates for N, IR and IRp for Overall Industry, Feature Phone and Smartphone Categories**

Product Category	Measure	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Industry	Numbers Equivalent	3	2	3	6	5	5	6	8	7	8	8	6
	Number of irrelevant brands	24	28	34	31	35	41	38	45	48	48	47	40
	Proportion of irrelevant brands	89%	92%	92%	83%	87%	89%	87%	85%	87%	85%	86%	86%
Feature Phone	Numbers Equivalent	3	3	3	7	5	5	5	6	7	6	6	3
	Number of irrelevant brands	14	17	25	24	30	32	29	30	22	20	17	15
	Proportion of irrelevant brands	80%	87%	88%	78%	86%	86%	85%	83%	77%	76%	72%	82%
Phablet	Numbers Equivalent						1	1	8	5	6	5	4
	Number of irrelevant brands						1	10	16	31	36	37	30
	Proportion of irrelevant brands						50%	88%	68%	86%	85%	87%	87%
Regular Smart Phone	Numbers Equivalent	1	2	2	3	5	4	5	7	7	9	9	8
	Number of irrelevant brands	12	14	15	15	15	28	29	36	44	36	38	28
	Proportion of irrelevant brands	89%	89%	90%	85%	77%	88%	85%	85%	86%	81%	80%	79%

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

**Table 2.8: Estimates for N, IR and IRp by Technology Generations**

Technology Generation	Measure	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2G	Numbers Equivalent	2	2	1	2	2	4	4	5	3	5	5	5
	Number of irrelevant brands	10	11	14	23	19	23	23	28	23	18	15	9
	Proportion of irrelevant brands	87%	87%	90%	92%	90%	86%	83%	86%	87%	77%	75%	66%
2.5G	Numbers Equivalent	4	3	5	7	6	6	7	8	8	7	5	5
	Number of irrelevant brands	20	25	29	25	29	31	28	29	24	18	16	12
	Proportion of irrelevant brands	83%	89%	87%	77%	83%	84%	81%	79%	77%	73%	76%	69%
3G	Numbers Equivalent	1	2	2	4	4	3	4	7	9	9	6	2
	Number of irrelevant brands	8	12	13	15	16	27	28	38	34	23	14	3
	Proportion of irrelevant brands	84%	88%	87%	81%	79%	89%	88%	85%	79%	72%	71%	51%
4G	Numbers Equivalent						1	3	4	4	7	7	6
	Number of irrelevant brands						2	4	10	36	37	43	36
	Proportion of irrelevant brands						63%	54%	72%	89%	84%	86%	86%

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

The estimate for numbers-equivalent and the corresponding number of irrelevant brands is less optimistic than that for HHI. With declining HHIs, the proportion of irrelevant brands have steadily declined in most segments, however they are still relatively high. While the number of brands in most

of the market segments is increasing (Table 2.3 – 2.5), the brands have been unsuccessful in capturing significant market shares. For 4G enabled mobile phones and the phablet category, the proportion of irrelevant brands has increased over time. However, in the price band segmentation, the proportion of irrelevant firms has increased in the

lower price bands. In the higher price bands i.e. \$300 to above \$700, the proportion of irrelevant brands has decreased over time, although the decline is not steady (Refer to Appendix 2). The number of irrelevant firms implies that the level of competition is in fact lower than that projected by the active number of firms in the market. This is established by the presence of several small firms in the industry, which are captured in the IDC data as 'Others' and collectively comprise almost 30 percent of the market. The pool of the firms however changes annually as there is rapid entry and exit. Many firms that don't intend to scale up and may exit after dip sticks in the market. This is especially true of fly by night operators. However, some new entrants, both domestic and foreign were able to become relevant players in the market. Indian brands like Micromax, Lava, Karbonn and Intex that dominated the market and held a share of almost 50% in 2014, rapidly lost their share to Chinese brands and accounted for less than 9% in 2018.<sup>52</sup> On the other hand, Chinese smartphone brands have successfully carved out a share among Indian consumers. According to Counterpoint Research, Chinese brands not only sport better specifications, they have maintained affordable pricing and kept pace with improvements in technology, particularly the sudden shift from 3G to 4G in India. Consequently, several brands have been rendered irrelevant. Indian brands like Micromax were left them with huge stocks of 3G smartphones in their supply chains, in a market that was focusing on 4G devices.<sup>53</sup> Policy interventions that empower a larger pool of competitive manufacturers and increase their relevance in the market, will reduce the risk of monopolisation in the future.

## 2.2.2 Other Measures of Market Concentration

The academic search for the defining measure of concentration has led to the development of several indicators to complement HHI and to overcome its reported limitations. The Holy Grail has however been elusive. HHI and numbers-equivalent thus continue to be the most popular empirically, although it is useful to complement these with other measures of market concentration such as the N-Concentration Ratio, Horvath Index, Entropy Index, Ginevicius Index and the GRS Index.

The K-Concentration Ratio defined as  $C_k = \sum_{i=1}^k S_i$ , where  $S_i$ <sup>54</sup> is the market share for each of the top  $k$  firms in the industry. This measure is very sensitive to the choice of  $k$ . It provides information about changes in market share between the top  $N$  firms in an industry, but does not capture changes in distribution.

The Horvath Index (1970) is defined as  $HOR = S_1$ <sup>55</sup> +  $\sum_{i=2}^N S_i 2(2 - S_i)$ , where  $S_1$  is the market share of the largest firm in the industry. This index assigns larger weights to all firms as compared to the HHI<sup>56</sup>. As a comprehensive concentration index (CCI) it discretely accounts for the share of the largest firm and for other firms in a weighted form<sup>57</sup>. The value of the index ranges between  $\frac{3n^2 - 3n + 1}{n^3}$  and 1 provided  $n$  is not equal to two. However, this index is not popular in use as it does not provide for theoretical or computational advantages as compared to other indices.

The Entropy Index is measured using the formula  $E = \sum_{i=1}^n S_i \ln\left(\frac{1}{S_i}\right)$ . The index is derived from the information theory and measures the degree of uncertainty faced by a firm in the market place. The value of the index varies from 0 to  $\log(n)$  where  $n$  is the number of firms. The value of the index approaches 0 if the market is a monopoly and reaches its highest value  $\log n$  in a perfectly competitive market i.e. market shares of all firms are equal and market concentration is the lowest. The Entropy Index assigns larger weights to smaller firms as compared to the weights assigned during computation of the HHI. The Entropy Index fails the test of duopoly - the formula results in the highest value predicting perfect competition for an underlying duopoly market.

The Ginevicius Index is measured using the formula  $GIN = \sum_{i=1}^n \left(\frac{S_i}{1 + n(1 - S_i)}\right)$ . The value of the index ranges between 0 and 1. This index also fails to represent true market concentration especially when shares are skewed in favour of a few firms. For example, if there are two firms in a market where one has 90% market share and the other has 10%, then the index takes a value of approximately 0.786 which is relatively low considering the high degree of concentration in this market.

The GRS Index is measured using  $GRS =$

$\sum_{i=1}^n \left( \frac{n^2 S_1 + 0.3 S_2}{n^2 + 0.3 n S_1} S_i \right)$ . This index is based on the Taylor Series. The value of GRS lies between 0 and 1 and it takes the value  $1/n$  if all firms have equal market share. It is believed to provide the most accurate measure of market concentration<sup>58</sup>.

The estimates for all indices across different segments of the industry are provided in *Appendix 3*. All results point towards improving competition

across different segments of the industry with the exception of phones belonging in the higher price category. This has already been indicated in the discussion on HHI estimates. We present a correlation matrix (*Refer Table 2.9*) at the industry level to present a comparison across different indices. The HHI correlates well with other measures of concentration, with most coefficients above 0.9. The negative correlation with the Entropy Index and N is because of the use of reciprocals in the formula.

**Table 2.9: Correlation Matrix for Different Measures of Concentration at the Overall Industry Level**

	HHI	C4	GIN	GRS	E	N
HHI	1					
C4	0.8906 (0.0001)	1				
GIN	0.9694 (0.0000)	0.898 (0.0001)	1			
GRS	0.9897 (0.0000)	0.8305 (0.0008)	0.9513 (0.0000)	1		
E	-0.9712 (0.0000)	-0.9645 (0.0000)	-0.9712 (0.0000)	-0.9365 (0.0000)	1	
N	-0.9547 (0.0000)	-0.9494 (0.0000)	-0.9142 (0.0000)	-0.9284 (0.0000)	0.9704 (0.0000)	1

(Numbers in parentheses are p values, all correlation coefficients are significant at the 95% level of significance, p values <0.05)

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

In summary, the market concentration analysis finds an increase in market consolidation, particularly from 2016 to 2018, owing largely to the recent exits of smartphone brands from a hyper-competitive mobile handset market in India. We know that HHIs have been declining and alongside the proportion of irrelevant brands. However, the numbers-equivalent analysis reveals that there continues to be a high proportion of irrelevant firms in the industry.

Several fringe firms have been unsuccessful in capturing market share, large enough to influence the level of competition in the industry. However, some Chinese brands have steadily out-competed their Indian counterparts, who have failed to match the sophisticated features, the constant improvements in specifications and affordability offered by Chinese brands. Policy interventions that help strengthen capabilities of the smaller firms by developing the overall ecosystem will definitely help

improve the competitiveness of Indian firms and secure the level of competition in the future.

### 2.2.3 Product Differentiation and the MCI Index

In the introduction we highlighted the fragmented nature of the mobile handset industry. Product differentiation in the industry is high, in part due to consumer demand for variety.<sup>59</sup> In addition, there is anecdotal evidence to suggest that consumers change handsets often, sometimes even within a year<sup>60</sup>. Product differentiation is an important determinant of market concentration. Economic theory suggests that product differentiation enables firms to establish entry barriers<sup>61</sup>. Empirical evidence supports the claim that product differentiation influences market concentration and confers market power<sup>62</sup>. Milne in 1992<sup>63</sup> proposed a new index to calculate market concentration in differentiated markets. The three step procedure for measuring concentration is – define the relevant

market and submarkets and measure product market differentiation and concentration. To begin, concentration is estimated for each sub-market by taking the sum of squared sub-market shares. A submarket concentration index (SCI) is defined as  $SCI_i = \sum_{j=1}^m S_{ij}^2$  where  $S_{ij}$  is firm  $j$ 's share in the submarket  $i$ . The properties of this measure are identical to those of the HHI, except that SCI, is measured at the submarket level rather than the total market level. Once submarket concentration indices have been calculated, a market concentration index (MCI) can be calculated by taking a weighted average of the submarket concentration indices. A weighted average is used because it captures the relative level of monopoly power in each submarket. The weights are determined by the size (total sales) of each submarket.  $MCI = \frac{\sum_{i=1}^n W_i SCI_i}{\sum_{i=1}^n W_i}$

MCI has the same bounds as HHI- ranging between zero (many small firms and hence no concentration) and 10,000 (monopoly). However, unlike HHI, MCI has important additional properties. Since MCI is a weighted average, it adjusts for the firms' differentiated product offerings across submarkets. The result is a value that is greater than or equal to the HHI. The lower bound of MCI is equal to that of the HHI and is achieved if there is only one submarket or if the market share distribution corresponds to the submarket share distributions. The upper bound is a monopoly situation (like that of the HHI) and in markets where firms have partitioned to create completely different submarkets. In general, the lesser the degree of product differentiation, the closer MCI is to HHI; the greater the degree of product differentiation, the closer MCI is to 10,000.

Product differentiation is measured by the ratio of MCI and HHI.  $PMD = MCI / HHI$  ranges between 1 and  $n$ , where  $n$  is the number of firms, and each firm belongs to a different market segment. Higher the value of PMD, lesser is the rivalry among firms as each offers a differentiated product. Conversely as product differentiation declines the market will become increasingly rivalrous with more firms contesting in the same market (sub-market).

We first measure PMD using the feature phone, phablet and regular smart phone categorization of mobile phones. The average value of the index over the period 2007 to 2018 is 1.94. Since PMD is greater than 1, there definitely exists a degree of product differentiation; whether high or low becomes clearer once we compare the numbers over time and across different types of categorisations. This was also apparent from the sub-market shares for different brands which dominated different categories of mobile phones. Using the technology generation categorisation we find a rising trend in PMD. The average estimate of PMD before the introduction of 4G phones in 2012 was 1.12, and 1.99 for the period 2013 to 2018 (*Please refer to Table 2.10a*). The number of 4G models increased from 6 in 2012 to 1060 in 2016 and dropped to 668 in 2018. The number of models in the 3G category increased from 96 in 2007 to 462 in 2012, 848 in 2016 and 14 in 2018, explaining the rise in PMD from 2007 to 2016 and the subsequent decline. For the overall market, manufacturers began to rationalize the number of available models<sup>64</sup>. The increase in PMD is less sharp if we use the feature phone, phablet and regular smart phone categorization (*Please refer to Table 2.10b*).

**Table 2.10a: PMD Estimates for the Mobile Phone Industry in India Using Technology Generations as Submarkets**

Year	PMD	Average PMD
2007	1.116364	1.12
2008	1.046757	
2009	1.092663	
2010	1.228734	
2011	1.130035	
2012	5.680758	1.99
2013	2.907083	
2014	3.04456	
2015	2.193672	
2016	1.469042	
2017	1.220589	
2018	1.126197	

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

**Table 2.10b: PMD Estimates for the Mobile Phone industry in India Using Phone Type as Submarkets**

Year	PMD	Average PMD
2007	1.067669	1.07
2008	1.013846	
2009	1.035181	
2010	1.165377	
2011	1.070023	
2012	1.160053	1.21
2013	1.297605	
2014	1.216235	
2015	1.124116	
2016	1.127969	
2017	1.136547	
2018	1.356361	

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

We further dissect the market for each technology generation into price bands<sup>65</sup>, treating each generation as a separate market and the price bands as submarkets within each technology market. Not all technology generations find models across each price band. For example, the most expensive 2G phones fall within the \$100 - \$125 band, while 2.5G and 3G phones were available across all price bands at least at some point between 2007 and 2016. 4G phones were not

available in the less than \$25 category until 2017. A summary of PMD estimates for each technology generation is provided in Table 2.11 below. Product differentiation has increased in the 3G market up until 2016 after which it declined. On the other hand, PMD increased steadily between 2012 and 2018 in the 4G market. An increase in PMD is observed even in the 2G and 2.5G markets, however, the 4G market is least rivalrous among all four technology generations.

**Table 2.11: PMD Estimates for the Market of Each Technology Generation Using Price Bands as Submarkets**

	2G	2.5G	3G	4G
2007	1.02	1.45	1.06	
2008	1.05	1.21	1.04	
2009	1.03	1.31	1.13	
2010	1.02	1.41	1.50	
2011	1.02	1.32	1.93	
2012	1.03	1.39	1.47	1.11
2013	1.24	1.40	1.41	1.64
2014	1.40	1.49	1.60	1.78
2015	1.50	1.35	1.59	1.53
2016	1.05	1.39	1.60	1.82
2017	1.30	1.62	1.45	1.95
2018	1.29	1.59	1.00	2.12

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

## 2.2.4 Entry and Exit of Firms – Implications for Competition

Entry and exit are drivers of the competitive process in any market. Anti-trust authorities rely on dynamic entry to do what their charter mandates i.e. promote and maintain competition<sup>66</sup>. The cliché that competition is the best regulation is not only true but arguably more efficient than regulatory intervention. Empirical evidence finds that industry concentration rates reduce the survival of new plants but only in markets marked by low entry and exit rates<sup>67</sup>. Investigating entry and exit of firms in the mobile phone industry reflect levels of competition and therefore could be used to determine the need and nature of the regulatory and policy response<sup>68</sup>. We define:

- **Entrant Firm (Nt):** A firm is an entrant in the year when it is first observed to have made sales during the period of analysis. So, a firm is an entrant in time period 't' if it has not made any sales in time period 't-n' over the timeframe considered.
- **Exiting Firm (Et):** A firm is exiting in the year post which it has not made any sales over the timeframe of the analysis. A firm is exiting in time period 't' if it does not make any sales in time period 't+n' over the time period considered.

- **Continuing Firm (Ct):** A firm is continuing in time period 't' if it has made sales in both the time periods 't' and 't-1'.

These definitions help avoid problems associated with choosing some arbitrary time period to differentiate between permanent and temporary inactivity. Using these definitions, we define the entry, exit and churn rate as follows:

- **Entry rate** (as a percent of all firms in a given period): This is the number of new firms as a proportion of all the firms operating in the industry during the period under consideration.

$$\text{Entry Rate} = Nt / (Ct + Nt)$$

- **Exit rate** (as a percent of all firms in a given period): This is the number of exiting firms as a proportion of all the firms operating in the industry during the period under consideration.

$$\text{Exit Rate} = Et / (Ct + Nt)$$

- **Churn Rate** (as a percent of all firms in a given period): This is the sum of the entry rate and the exit rate indicating how dynamic the industry is.

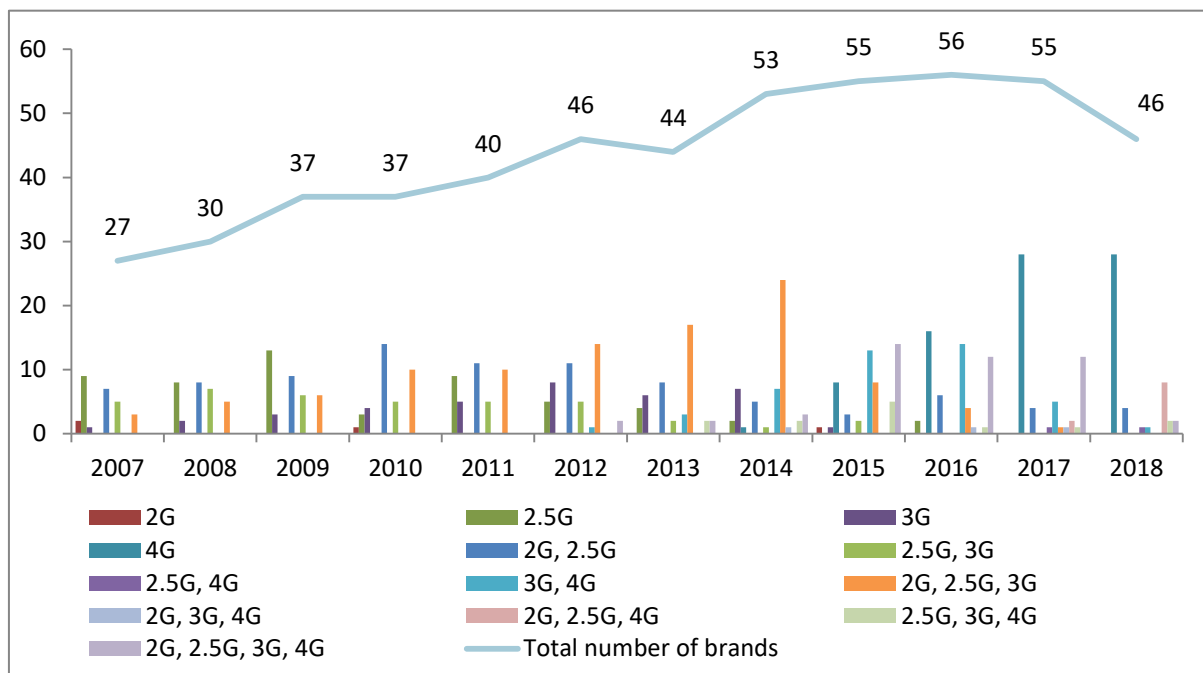
$$\text{Churn Rate} = \text{Entry Rate} + \text{Exit Rate}$$

A simple yet effective way to analyse entry exit activity is to record the number of firms operational in the market and the corresponding changes in the numbers over time. We use data for the period 2007 to 2018 for this exercise. For a better understanding of the trend we also provide the number of firms manufacturing phones across different technology generations. There are very few firms that focus on an exclusive generation of phones, except perhaps for 2.5G until 2014 and 4G in 2015 and 2016. Figure 2.4 provides a representation of the total number of firms in the market along with the number of firms producing a single type or mix of technology generation phones.

The number of firms producing phones across all technology generations has increased substantially since 2012.

The rise in the total number of brands until 2015 is on account of a higher entry versus exit rate. From 2016, exit rate begins to surpass entry rate, and the total number of brands in the market also fall. While entry rate has declined over time, the trend in exit rate is mixed. The highest exit rate is observed in 2017. Churn rate in the industry has followed a steady decline over time. Figure 2.5 provides data for number of firms, exit, entry and churn rates for the overall industry from 2007 to 2018.

**Figure 2.3: Number of Brands in the Industry and also Across Different Technology Generations**



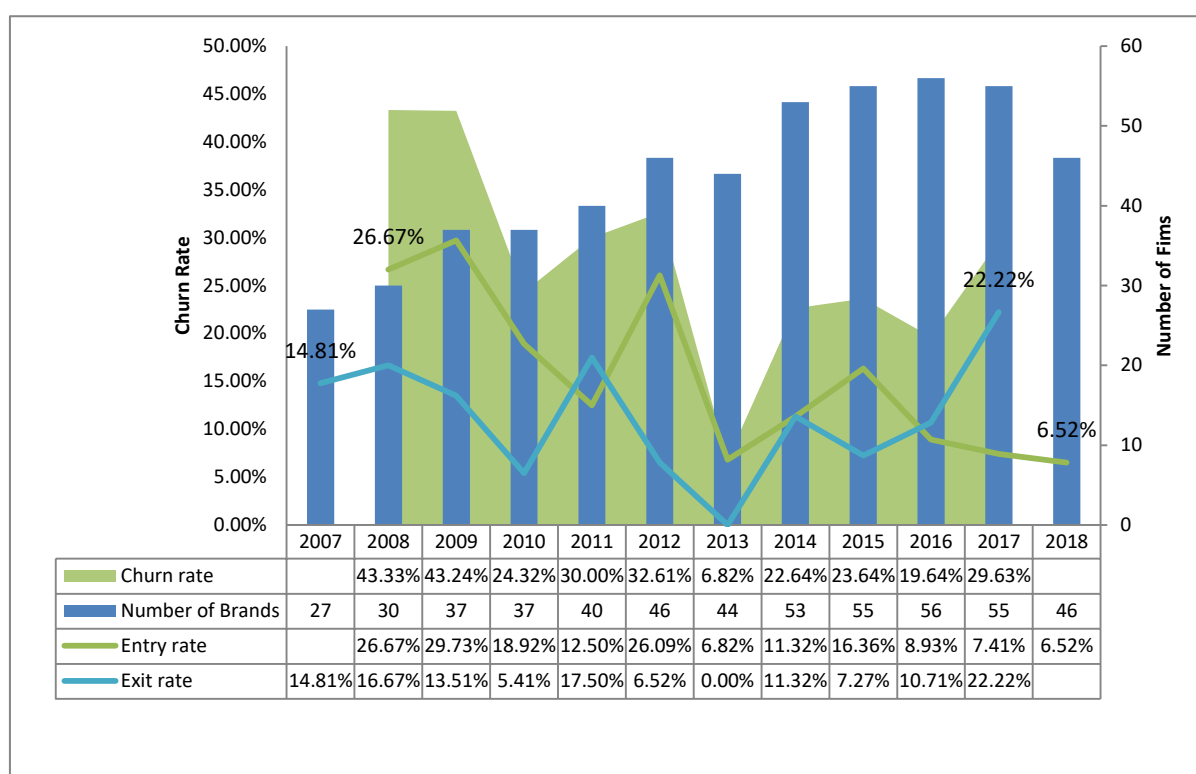
Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

Entry and exit could also be a surrogate for expected profits. For example, instances of one-round entry and one-round exit<sup>69</sup> in case of homogenous firms may reflect market expectations. When expected profitability is high, firms are more likely to enter than leave the market and vice versa<sup>70</sup>. There are also findings in the literature related to hit-and-run entry. For India's mobile phone market, several cases of hit and run entry exist where firms have either exited the entire market/ or a particular sub-market within two years

of starting operations (Refer to Appendix 5 for brand-wise details). This could be a case of exuberant firms whose expectations at entry are not realised in the market and thus exit becomes a rational choice. In a contestable market<sup>71</sup>, hit-and-run entry or even the threat of it leads to outcomes which mimic those of competitive markets (e.g. zero long-run profit) even if the market structure is not competitive<sup>72</sup>. Thus competition for the market could lead to competition in the market.



**Figure 2.4: Industry Level Estimates for Number of Brands, Entry, Exit and Churn Rates**



Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

An analysis of industry churn for different market segments finds rising exits across 2.5G and 3G manufacturers. For 2G, wherein the exit rate rises up until 2012 and then shows an overall decreasing trend, declining finally to 0% in 2017. While several firms were exiting the older technology sub-markets, there were still some firms entering these markets even until 2016, though the entry rates were very low. For 2G and 2.5G segments, there were no new entrants in the market in 2017 and 2018 (Q1 and Q2). In case of 4G however, since the market took off only in 2012, the exit rates have been close to nil, but increased later to almost 22% in 2017. In 2018, the entry rate also tempered to about 5%, from a peak of 65% in 2015. Within these segments, industry churn has demonstrated a rising trend for 4G phones and potentially signals a growing market, versus the case of 2G and 2.5G, which are relatively mature markets. Please refer to *Appendix 6* for the industry churn analysis of sub-markets defined on the basis of technology generations.

## 2.3 Conclusions

The handset market in India witnessed the entry of several small and big manufacturers, both Indian and foreign. The market demonstrated features of hyper-competition which eventually led to the exit of several brands, especially in maturing and/or obsolete technology segments. Moreover, competitive pressure led to a decline in the number of brands across most market segments in 2018 as manufacturers consolidated within and across segments. There was a consequent increase in measures of market concentration, albeit without raising any apparent antitrust concerns.

Analysis at the sub-segment level shows differential competition across categories. The market for premium phones, is small and relatively more concentrated. With Chinese brands acquiring a large portion of the market share, the number of active brands is very low. This is reinforced by the large number of irrelevant brands in the market. The product market differentiation and entry-exit analysis complement these findings. The degree of product differentiation as measured by the PMD



index, finds the market for 4G phones to be more concentrated, but also more dynamic than 2G and 2.5G. The industrial churn in 4G is mostly driven by the entry of new firms although it is showing signs of moderating.

Analysis of the composite handset market as well as the various sub-segments reveals two immediate and palpable conclusions. One, measures of competition as reflected in the several overlapping but mutually reinforcing indices reveal significant competition over time and across segments. There is no doubt that the structural estimates vary overtime and of late have shown a tendency to increase especially in segments where consolidation is taking place. Antitrust concerns surrounding this shift however are minimal. If the structural measures of competition are juxtaposed with the churn analysis, competitive concerns would be alleviated if not eliminated. The churn analysis suggests that high entry, real or expected (suggesting low entry barriers) acts as a market disciplining device even if concentration is rising. This is the inescapable truth of contestable markets.

The second striking feature of the handset market is the recent domination by Chinese brands. Even during times when Indian brands were enjoying high growth, the extent of value addition within the country was minimal as a large proportion of the components were being imported from China. The last three budgets have tried to incentivise local production by raising duties on imported components. While local value addition has increased slowly it still remains below 20% reflecting in part the efficacy of assembly in India and in part the disability that Indian manufacturing has to contend with. We return to this discussion in the final section of the report.

The next section complements the analysis in this section with survey findings on consumer preferences. For example, insights on brand stickiness or technology lock-ins, explain the outcomes from secondary data analysis and help build an appropriate policy response where necessary.

### 3. Survey Analysis

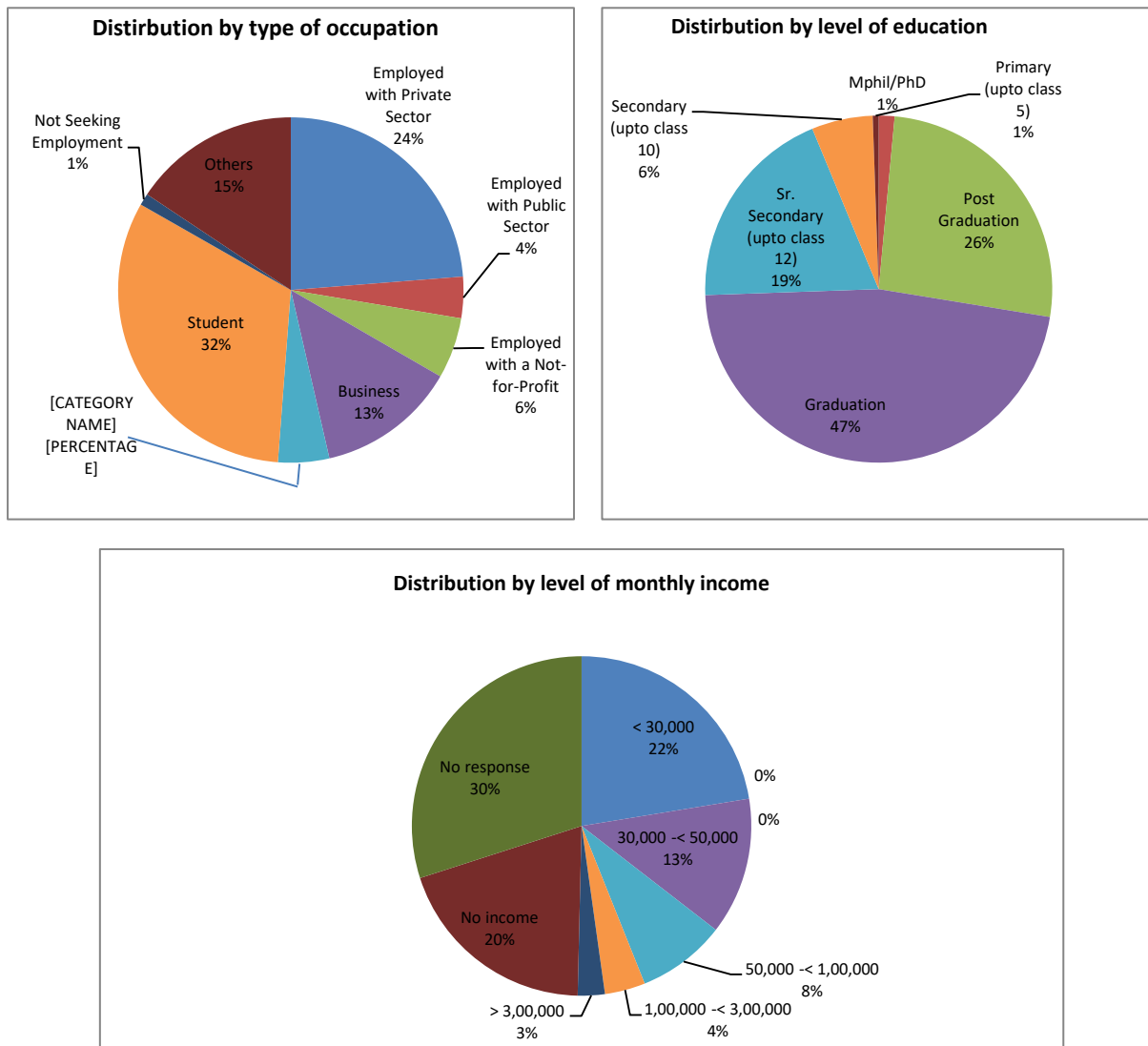
The rapidly changing economic landscape of the country has also influenced consumer buying behaviour. The decision process, including purchase, is influenced by rising affluence, the pattern of urbanization, and fundamental shifts in family structures.<sup>73</sup> The use and consumption of technology including digital services is among the most affected. As of September 2018, there were over 1.1 billion mobile subscribers in India.<sup>74</sup> The wide adoption can be attributed to a number of factors, including, reduction in costs of data plans, increased affordability of smartphones and the recent entry of Chinese brands such as Oppo, Vivo and Xiaomi, that offer cheaper devices with improved features including bigger screens, better user interfaces, local language support, etc.<sup>75</sup> Consumer preferences have adapted to the constant improvements in mobile technology and handset manufacturing. The demand for sophisticated features has created a virtuous cycle of innovation on the producer side. In this section, we analyse findings from a primary consumer survey of mobile phones to understand the demand side of the industry and how consumer preferences affect competition in the handset industry in India.

#### 3.1 Sample Description

To start, a structured questionnaire<sup>76</sup> was first piloted using a small sample in 2017. Inadequacies and inconsistencies were addressed in the revised version administered to a larger audience. Responses were collected using Survey Monkey, an online survey platform over a period of four months. We also sought the help of Hansa Cheeta, a microwork platform for data collection that

circulated our questionnaire among empanelled respondents. Using both platforms we received a total of 544 responses. Approximately 72% of the respondents belong to Tier 1 cities that include Delhi (as well as other parts of NCR), Mumbai (including Greater Mumbai and Navi Mumbai), Kolkata, Bangalore, Hyderabad and Chennai. The average age of respondents is approximately 27 years and the gender distribution is fairly equal.

Approximately 73% of the sample is comprised of graduates or post-graduates. Students make up the largest category under “Occupation” with a 32% share, followed by 24% employed with the private sector. While 30% respondents have not reported their monthly income, about 22% reported earning less than Rs. 30,000, followed by 20% who reported “No income”. Our survey does not capture rural consumers, although they make up for a substantial proportion of the demand and thus, naturally influence the demand side factors. Demand for features such as vernacular support, not only in handsets, but also in apps, arise from the rural and semi-urban population. The need for simplified operations on mobile phones becomes necessary given the low rates of digital literacy in India. Education, occupation and location play important roles in determining consumer preferences. While the sample is not completely representative, it captures some trends in purchase and usage of mobile phones in India. Approximately 96.9% respondents in our survey reported using a smartphone, while only 2.76% reported using feature phones. Figure 3.1 provides the sample distribution by level of education, type of occupation and monthly income in rupees.

**Figure 3.1: Distribution of Sample by Educational Qualification, Occupation and Monthly Income**

## 3.2 Survey Results

### 3.2.1 User Preferences for Brands and Features

The analysis in Section 2, points towards changing brand preferences among users, especially with the entry of Chinese brands over the last couple of years. Samsung, India's top smartphone seller<sup>77</sup> since 2012, was outstripped by Xiaomi in the last quarter of 2017. Our survey results almost mirror brand preferences indicated by secondary data in 2017. *The dominant brand, as illustrated in Figure 3.2 below, is Samsung, followed by Motorola, which is a subsidiary of Lenovo.* There is an equal share of Apple and Xiaomi users. While there may be gender and age specific brand preferences, our sample data does not adequately capture this. The choice of brand is driven by several factors, including

technology, design, brand, purpose as well as social reference groups (Ehtesham Mohammad, 2012).<sup>78</sup>

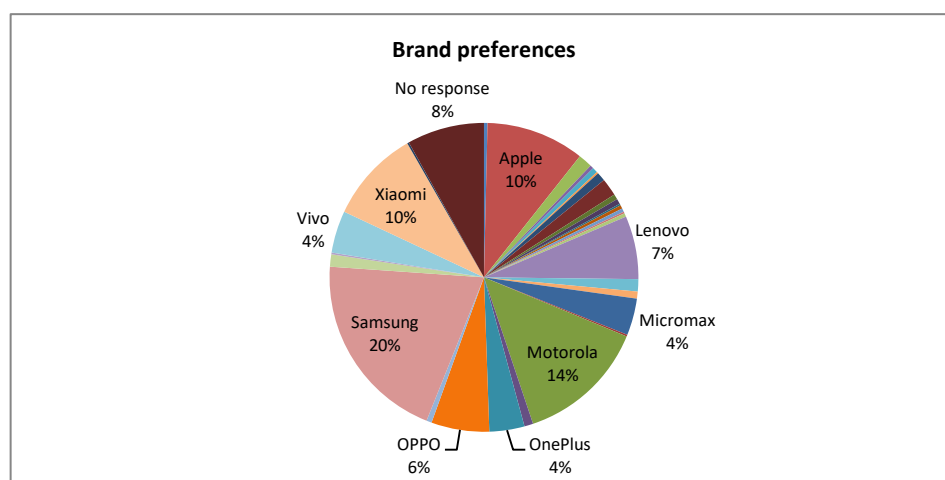
The primary survey reveals a significant departure in consumer buying behaviour for mobile phones in India. 42% respondents reported acquiring mobile phones online, followed by 39% who purchased from retail stores. Additionally, 49% respondents relied on recommendations from friends and family, while 34% relied on online resources for purchase (Refer Figure 3.3 below). While survey results indicate a change in trend with product reviews aplenty on the Internet, the reliance on word-of-mouth recommendations from friends and family continues to be significant. Evidence from the literature finds that word-of-mouth sources were perceived to be more reliable, credible and less biased (Edgett and Parkinson, 1993, Murray,

1991).<sup>79</sup> Due to the lack of tangible evidence to help evaluate a purchasing decision, consumers sought advice from family and friends which was regarded as independent, flexible, and more trustworthy, incorporating positive and negative perspectives.<sup>80</sup> In sum, data shows a massive marketing expense incurred by mobile phone companies on online retail platforms. Brands are ditching brick and mortar for smart sales through the online route. A successful case in point was the exclusive online launch of Xiaomi in 2014<sup>81</sup>.

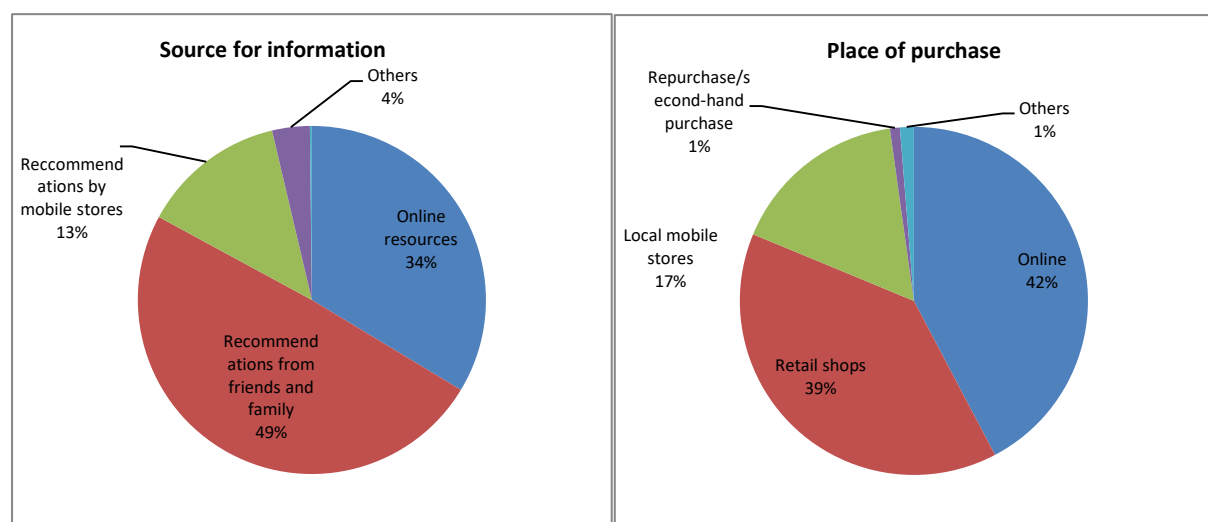
In general, consumer buying behaviour is influenced by two broad factors - individual and environmental.<sup>82</sup> While the former includes factors such as demographics, consumer knowledge, perception, motivation, lifestyle etc., the latter

includes factors like culture, social class, reference group, family, household etc.<sup>83</sup> Literature suggests that a consumer goes through five different steps while purchasing a product - need recognition, information search, evaluation of alternatives, purchase and post purchase evaluation (Schiffman et al, 2015).<sup>84</sup> However, in case of mobile phone purchases, consumers may either go through all five stages of rational decision making, or make a quick choice based on hedonic considerations.<sup>85</sup> Use of online platforms will play a significant role in each of the five steps mentioned above. While online platforms help address some information asymmetries in the market, maintaining their neutrality in terms of the information available is important to achieve competitive outcomes in the industry.

**Figure 3.2: Percentage Share of Brands among Surveyed Consumers**



**Figure 3.3: Place of Purchase and Source of Information for Purchase of Mobile Phones**



In order to develop a better understanding of consumer preferences the questionnaire was designed to assign scores to different factors influencing the purchase of mobile phones, such as brand, technology support, price, etc, as well as features of mobile phones such as battery life, memory, etc. Since India is a price sensitive market, we would have expected price to be one of the driving factors, however, our survey finds that respondents consider *“Technology Support (3G/4G support)” as the most important factor, followed by “Brand” for decisions driving the purchase of a mobile phone.* Recent studies also find that factors like quality, features and brand name have surpassed price as more important factors influencing choice of mobile phones.<sup>86</sup> With respect to features, *“Battery Life” was accorded the highest score followed by “Memory Storage” and “RAM and Processing Speed”.* Table 3.1, given below, tabulates the average scores assigned and the corresponding ranks of these factors and features based on their scores.

The results from our survey are not atypical. A study by Saif et al (2012) found that consumers valued new technology features as the most important variable driving their decision to purchase a new mobile phone.<sup>87</sup> Another study by Karjaluoto et al (2005), finds that price, brand and user interface tend to be the most influential factors, affecting the actual choice among mobile phone brands. Additionally, a study by Osman et al (2012) also found that after smartphone design, a built-in Wi-Fi adapter was the second most common specification that is important to consumers during a buying decision. This corroborates our findings on the importance of technology support; which on average has been ranked as the most important factor when considering purchase of a mobile phone.

While design and technology are tangible phone features, the preference for brands is also an

outcome of intangible aspects. Studies have found that purchasing branded products and preference for brand origin, depends on the age of consumers.<sup>88</sup> Research has examined the degree of strength in the relationship between marketplace-related beliefs and pre-purchase external search behaviour (Duncan and Olshavsky, 1982).<sup>89</sup> They find that sometimes, consumers simplify the search and evaluation process by focusing on brands, stores, labels or seller's market share. These variables are used as indicators of quality.<sup>90</sup>

The other deterministic factor is product differentiation that continues to characterise competition among manufacturers.<sup>91</sup> Two distinct development strategies are normally used by firms - vertical innovation and horizontal innovation (Kroski and Kretschmer, 2007).<sup>92</sup> The former represents improvements to the product's technical characteristics and establishes a clear quality ranking for consumers, while the latter entails development of new product characteristics that result in a significant improvement only for those with a higher willingness to pay.<sup>93</sup> Approximately 74.8% respondents said that if between two phones, ceteris paribus, one preferred feature such as battery, camera etc. were to improve, then they would be willing to pay more for the improved phone. In the highest income bracket (> Rs. 3,00,000 per month) respondents have expressed a willingness to pay 50% more in price for a phone when, other factors remaining the same, the quality of one preferred feature has been improved. Empirical evidence in literature suggests that increased competition coupled with continuous technological development has led to the emergence of dominant designs in vertical features. However, the determinant of competition is innovation in horizontal features, particularly in screen size and width, and even in operating systems to a certain extent.<sup>94</sup> From our secondary data analysis we find an increasing trend in product differentiation for the overall industry in India.

**Table 3.1: Average Scores Assigned to Important Factors and Features**

Factors and Features		Average Scores (On a scale of 1 to 5)	Rank (1 being the highest and 5 being the lowest)
Rating of these factors by importance for buying a mobile phone	Price	3.94	5
	Brand	4.1	2
	Operating System	3.98	4
	Service Centre Accessibility	3.99	3
	Technology support (3G/4G support)	4.27	1
Rating of features by importance	Battery Life	4.28	1
	Screen Size	4.01	6
	RAM and Processing speed	4.21	3
	Storage Memory	4.23	2
	Camera Resolution	4.13	5
	Vernacular Support	3.86	7
	Operating System	3.72	9
	Audio Quality	3.8	8
	Display Resolution	4.15	4

### 3.2.2 User trends for Mobile Phone Features and Apps<sup>95</sup>

“There’s an app for that” – Apple’s buzz-worthy phrase is now a reality<sup>96</sup>. The phenomenal rise of apps has transformed the use of mobile phones from only calling and messaging to several other technology enabled services. Our survey finds that that “Calls”, “E-mail” and “Internet Browsing” were

the features most frequently used on the mobile phone, followed by “Instant Messaging”, “Camera”, “Music”, “Videos” and “Games”. Among most frequently used mobile applications, “Social Networking” received the highest average score, followed by “News and Knowledge” and “Maps and Navigation”. Table 3.2 below provides a ranking based on average scores reported by respondents.

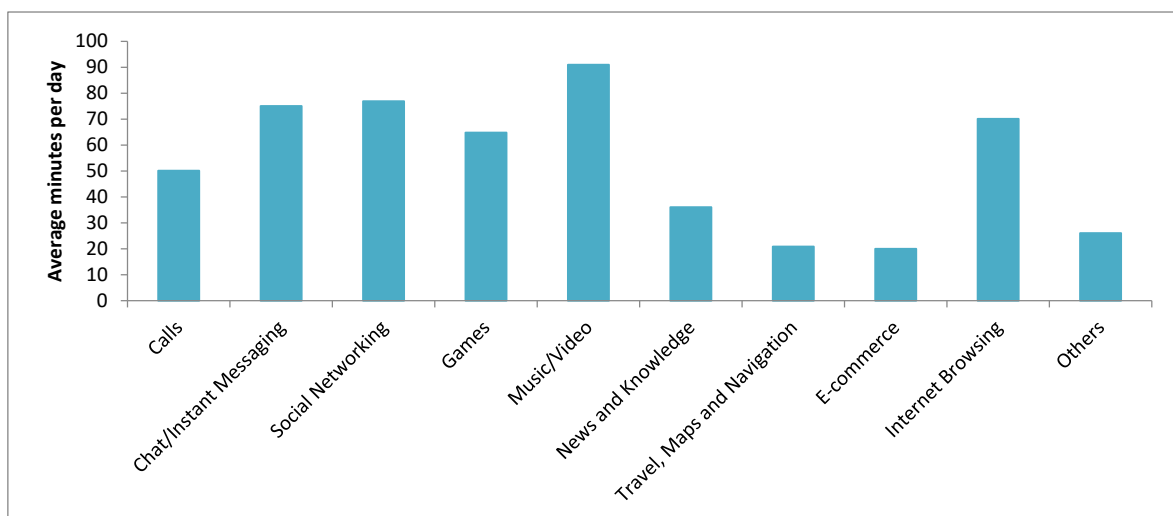
**Table 3.2: Average Scores Assigned to Features and Apps based on Frequency of Use**

Features and Apps		Average Scores (On a scale of 1 to 5)	Rank (1 being the highest and 5 being the lowest)
Rating of these features based on frequency of use	Calls	4.19	1
	Text/Instant Messaging	4.13	2
	Camera	4.12	3
	E-mail	4.19	1
	Internet Browsing	4.19	1
	Music	4.06	4
	Videos	3.61	5
	Games	3.43	6
Rating of these apps based on frequency of use	Social Networking	4.1	1
	Entertainment (Gaming, Music, Video)	3.31	6
	News and Knowledge	4.09	2
	Maps and Navigation	4.04	3
	Health and Lifestyle	3.91	5
	E-Commerce	3.99	4

Though “Entertainment” was reported to be the least frequently used application, *the average minutes spent per day was highest for “Music and Video”* (a part of followed Entertainment). The discrepancy could be associated with the misunderstanding or misreading of what encompasses “Entertainment” or a difference between the frequencies of usage versus the amount of time spent on an activity. This apparently conflicting result also holds in the case of Travel, Maps and Navigation” which was reported to be one of the most frequently used applications but among the lowest in terms of time spent. The other category for least time spent is E-Commerce. On the other hand, activities that take up most time are “Social Networking”, “Chat/Instant Messaging” and “Internet Browsing” in addition to “Music and Video” (Refer Figure 3.4) which was ranked the highest.

The results from our survey are similar to other survey results. According to a 2016 study by IAMAI and KANTAR IMRB, 69% respondents from urban India used the Internet for online communication, 68% used it for social networking and 50% used it for entertainment. 77% of these urban internet users reported that they accessed the internet through mobile devices. There are of course differences with respect to demography, especially if we compare our findings to research from other countries. Pew Research Centre’s surveys in the United States finds that Americans used their smartphones for a variety of purposes such as looking for a job and reading a book. According to their 2016 survey, 55% smartphone owners reported getting news alerts on their mobile phones, however, the frequency of these alerts was not very high. In another 2015 survey, 28% adults in the United States said that they had used their smartphones as part of their job search.

**Figure 3.4: Average Minutes Spent Per Day on Activities on a Mobile Phone**



Interestingly, the time of the day in which a certain app is used has been found to affect the time spent on that app. Studies have found that news applications were more popular in the morning and gaming apps at night, however, communication apps were found to be active through most of the day.<sup>97</sup> It was found that despite the availability of a variety of apps, communication apps were almost always used through the day.<sup>98</sup> Our survey results mirror some of these universal trends. Respondents report to use “Text/Instant Messaging” and “Social

Networking” most frequently and for substantial periods of time.

### 3.2.3 Lock-In Trends

The lock-in effect refers to a situation where consumers become dependent on a single manufacturer or supplier for a specific service and cannot move to another without substantial costs<sup>99</sup>. Lock-in trends impact the level of competition in an industry, especially those in which network effects

exist. If products are incompatible, switching costs and network effects bind customers to vendors, locking-in not only customers, but also markets to early choices.<sup>100</sup> Even when efficient options are available, customers find themselves hindered by lock-in<sup>101</sup>, giving vendors lucrative ex-post market power over the same buyer.<sup>102</sup> Firms compete ex ante for this ex post power, using penetration pricing, introductory offers, and price wars.<sup>103</sup>

We received almost equal proportion of responses on brand stickiness. *244 respondents (44.85%) expressed a willingness to switch to a different model within the same brand or a completely different brand and model, while 256 respondents (47.06%) did not want to switch.* Among those who were unwilling to switch, the commonly cited reason was familiarity with the functionality of their current phones. Some of the other reported reasons were - other brands did not offer a similar phone within the same price range or being locked-in by device type and/or operating system. However, a majority of the respondents did not provide any reason for their unwillingness to switch brands/models. Out of the 244 respondents who expressed a willingness to switch, the highest frequency response was the need for new experiences and features in a device (33.6%), followed by availability of better options in the same price range in other brands (16%). Some also reported high cost of repair/service or poor service experience as the reason to switch. A high proportion among those reporting willingness to switch also reported buying mobile phones once in 2 years.

Lock-in is often considered a means to increase customer loyalty and , create a market for cross-selling opportunities, bind consumers to the business, and eventually gain recurring revenues from the same pool of customers (Amit & Zott, 2001; Farrell & Klemperer, 2007; Harrison, Beatty, Reynolds, & Noble, 2012).<sup>104</sup> It is sometimes suggested that businesses incorporate lock-in into their business models to achieve higher economic sustainability and increase levels of value creation and revenue generation.<sup>105</sup> When an entrenched dominant standard exists in the industry, or when

an industry is in the process of identifying a dominant standard, then other firms stand at a risk of being locked out of the market because the technology standard it supports is rejected in favour of a competing standard.<sup>106</sup>

Technical interrelatedness between hardware and software components also leads to technology lock-ins<sup>107</sup>. For example, a particularly useful app that might be available on Apple's app store, may not be available on Google Play Store for android platforms. Products of Apple such as chargers are uniquely designed, while for other brands, chargers are interchangeable. While our survey findings don't find strong evidence of lock-in trends in the industry, we cannot rule out the possibility of lock-ins at least within certain niche segments of the market. Overall it appears that designs, features and usage of smartphones are acquiring a dominant general structure. With increased knowledge of technology usage, switching between devices with different operating systems does not act as a major hindrance. In fact, the rising level of product differentiation in the market, also establishes the willingness among consumers to experiment with new models. Anti-competitive outcomes on account of lock-ins are therefore not an immediate concern for the industry. This however excludes the analysis on phones being bundled with service packs, i.e. collaborations between service providers and phone manufacturers, and the overall impact on the industry.

### 3.2.4 Price Trends

With rising household incomes, decline in average price of smartphones, familiarity with functionality of mobile devices, availability of superior features and their application in our daily lives, the willingness to own and pay for mobile phones has also increased. *According to our survey result, the price bracket "Rs 10001 - 20000" has emerged as the most popular among respondents across all income categories (Refer Table 3.3).* This reflects a predominant demand for mid-range handsets independent of monthly incomes. In the high income category this preference can be attributed to the need for frequent replacements of phones.



**Table 3.3: Number of Responses for Each Price Bracket across the Range of Monthly Incomes**

Monthly Income	Price bracket for purchasing a mobile phone							Blank responses
	< 2500	2501 - 5000	5001 - 10000	10001 - 20000	20001 - 30000	30001 - 50000	> 50000	
< 30,000	4	4	16	78	14	4	2	0
30,000 -< 50,000	2	1	10	46	10	1	1	0
50,000 -< 1,00,000	0	0	5	22	11	6	2	0
1,00,000 -< 3,00,000	0	0	0	11	4	4	2	0
> 3,00,000	0	0	1	9	1	1	2	0
No income	2	0	12	45	22	18	8	0
Blank Response	2	1	17	127	10	6	0	0

The demand for mobile phones is also driven by the increasing affordability of mobile services.

According to data from the World Bank, even though 8 in 10 people own a mobile phone in the developing world, the cost of using mobile phones significantly varies.<sup>108</sup> Excluding the cost of handsets, the cost (adjusted for PPP) of using a mobile phone in India is \$2.80, which is however higher than the cost in countries such as Sri Lanka (\$0.97), Bangladesh (\$1.42), Iran (\$2.01), Pakistan (\$2.12) and Nepal (\$2.49).<sup>109</sup> In rural India, mobile phones are often the only source of accessing the Internet. A study conducted by the NSSO for the July 2014 - June 2015 period show that among services, the expenditure of rural households is the highest for mobile phones and communication services, accounting for 25.33% of their total spending, while that for urban households was marginally higher at 26.33%.<sup>110</sup> Almost three quarters of present day urban Internet users use only mobile phones for internet access as compared to a mere 52% in 2014 and this growth is being driven by falling smartphone prices, less expensive data packages, and the availability of more mobile-friendly content.<sup>111</sup>

The bundling of mobile handsets with telecom services makes expenditure on mobile services a determining factor in handset selection.<sup>112</sup> For example, Micromax's Canvas 2 smartphone was launched with a year-long offer of free 1GB data per day and 600 minutes of calls from Airtel.<sup>113</sup> In contrast to developed markets<sup>114</sup>, handsets in India have been traditionally sold independent of tariff plans.<sup>115</sup> However, with structural shifts in the post-

Jio telecom industry, such bundling plans are being symbiotically used by mobile phone manufacturers and service providers to secure competitive positions in the industry.

### 3.2.5 Trends in the Market for Second Hand Phones

The durable goods literature is vast and rich. A consumer durable such as a smartphone yields utility over time so there will be a long period between successive purchases. A 2014 study by the Consumer Electronics Association found that smartphones and feature phones had a life expectancy of 4.7 years.<sup>116</sup> However, more recent estimates suggest that the average phone has a use phase of less than two years.<sup>117</sup> Several studies have shown that second-hand market activity can support and promote primary markets by making existing products into "liquid assets" that consumers can easily sell (Fox 1957).<sup>118</sup> Although suppliers do not directly gain from the sale of used goods, studies show that the existence of a secondary market increases consumers' valuation of a new good, which can then subsequently lead to higher supplier profits.<sup>119</sup>

Our results establish that the replacement cycle is becoming shorter; part of the reason could be a vibrant market for second hand phones. Even though the average selling price of smartphones (mobile phones in general) has steadily declined, the second-hand market for handsets continues to thrive. Constant improvements in technology have made upgrade cycles of smartphones shorter, and

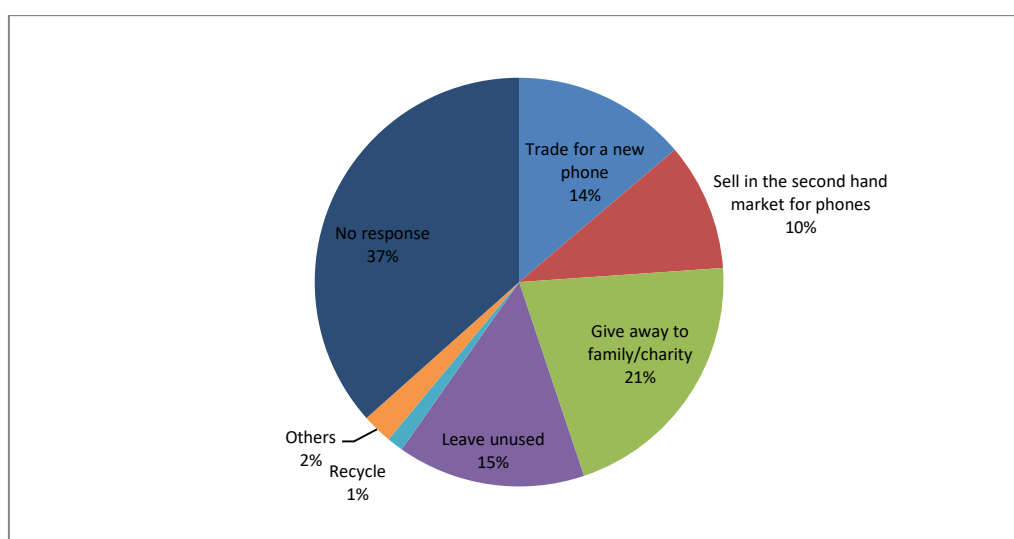
thus fuelled demand for second hand smartphones.<sup>120</sup> Numerous trade-in and buy-back programs across multiple channels and platforms have also significantly contributed to the growth of the market for used smartphones.<sup>121</sup> The supply side is fed by those who want to change their phones frequently and experience the latest upgradations in technology.<sup>122</sup> According to IDC estimates, the worldwide market for used and refurbished smartphones is set to grow to 222.6 million units by 2020.<sup>123</sup>

The second hand market can be split into two categories - the first is through local retailers and

the second is refurbished markets.<sup>124</sup> In the former market, used mobile phones are traded through local retailers or online platforms, while in the latter, phones are tested and repaired before being resold. These come with a guarantee as well as a price premium.<sup>125</sup> Our survey does not distinguish between these two types of markets. Only 10% respondents reported selling their phones in the second hand market, while 14% reported trading or exchanging their old phones for new ones.

Handset manufacturers also leverage the benefits of the *used-phones market* through exchange offers.

**Figure 3.5: Usage of Old Mobile Phones**



Growth of the used-goods business in India is thriving with the help of e-commerce and with websites and apps like OLX and Quikr dedicated to this marketplace. There were almost 10 million mobile phones and mobile accessories listed on OLX in FY 2016-17 alone.<sup>126</sup> There has also been a growing realisation among consumers that there is value attached to a used device that can be extracted by reselling rather than keeping them as idle assets at home. However, industry reports show that 80% of the trade of pre-used mobile phones is still offline through dealers, retailers and shop-owners.

In our survey, 59 respondents, i.e. 10.85% of the sample reported that they would buy a mobile phone from the second hand market, while approximately 51.5% respondents reported that

they would not buy mobile phones from the second hand market. Of those willing to buy phones from the second hand market, a majority of approximately 35.6% were students. The average scores assigned to the following features by those willing to buy mobile phones from the second hand market is given in *Table 3.4* below. The highest score has been assigned to “Better Features/Functions than existing phone” closely followed by “Age and Condition” and “Background of phone seller”. The least score has been assigned to “Price”, though not significantly lower than other factors.

Lack of information about the quality of used goods in second-hand markets drives down prices; this is an instance of “adverse selection” (Akerlof 1970).<sup>127</sup> The presence of this information asymmetry leads

to a “lemons” problem where low-quality goods drive out high quality goods in static markets<sup>128</sup>. Although, one might expect that the emergence of Internet-based second hand marketplaces would bridge the information asymmetry, in the form of customer reviews and other crowd sourced

information, studies suggest that is not entirely the case. Studies suggest that despite the presence of signaling mechanisms like reputation feedback and product condition disclosures, the information asymmetry problem between buyers and sellers persists in online markets.<sup>129</sup>

**Table 3.4: Average Score for Features/ Factors of Second Hand Mobile Phones**

Feature/Factors	Average Score
Price	3.66
Brand	3.81
Better Features/Functions than existing phone	3.98
Age and Condition	3.93
Background of phone seller	3.83

A survey conducted by IMRB for OLX Consumer Research on Used-Goods and Selling Trends (OLX CRUST) shows that nearly 4 million pre-owned mobile phones are sold online in India and 75% of the pre-owned mobile phone buyers and 55% of their sellers were young millennials aged between 19-29 years.<sup>130</sup> This corroborates our findings where the average age of those willing to buy phones from the second hand market is 25 years. The average price of each mobile phone sold on OLX was Rs. 9000 compared to the average selling price of new smartphones in India which is Rs. 10,000.<sup>131</sup> The need to frequently replace smartphones and experience technology upgradations also implies that most second-hand phones are not necessarily overused and that premium price phones are also available in this market.<sup>132</sup>

Our survey findings show that approximately 49% of those who were willing to buy phones from the second hand market reported that they would buy at a discount of 20-40%. There has been a steady influx of Chinese brands in the secondary market as well, with Xiaomi, Lenovo and OnePlus showing the highest growth in the marketplace, while Apple continues to enjoy aspirational value.<sup>133</sup> This market also attracts first time smartphone users as many feature phone users who want to experience video, data and content, can't necessarily afford a high budget purchase.<sup>134</sup>

### 3.3 Summing up Survey Findings

The survey findings reinforce the prevailing understanding on the subject. However, since the respondents mostly belong to the urban youth category, we cannot extrapolate these results for all sections of consumers; although it is valuable in identifying some changing preferences in the industry. Firstly, we find that handset choices are driven largely by the technology support they offer and features such as battery life and screen size assume higher importance than price. Evidence from the existing literature corroborates this finding. A recurrent response has been the willingness to pay a premium for improvements in the preferred feature of the phone. While familiarity with functions and improvements in digital literacy may have generated quality-sensitive demand, rapid changes in technology have also led to shorter replacement cycles of mobile phones, especially among those who can afford it.

While there is evidence that familiarity with the operations and functioning of the existing phone determines future choices of handset brands, a very large percentage of respondents also report a willingness to switch to other models and brands for new experiences and features. This also explains the increased product differentiation in the market. Despite these new trends, there is a clear preference for mid-range smartphones, regardless of income levels. The other determinant of affordability is the low costs of operating a mobile phone, and with bundling of handsets and service

plans, these costs are likely to influence consumer preferences for handsets.

With declining handset prices and the tremendous uptake of mobile data, smartphones have become the device for accessing the Internet, especially in rural areas. Thus, in terms of usage, e-mail and Internet browsing emerge as the most frequently used features, apart from calls. The phenomenal rise of apps and the easy access to myriad daily services using a mobile device has rendered them important considerations and increasingly indispensable. As per our survey, social networking, news and knowledge and navigation apps are also frequently used, making mobile phones a multi-utility device and consequently changing the factors that drive its demand.

The breadth and depth of the used phones market in India is likely to influence demand in the primary market. Although most respondents reported that their used phones were given away to family/charity or were left unused, there is some

evidence of selling old phones in the second hand market and trading/exchanging old phones for new ones. Respondents, albeit a small percentage, have also a willingness to buy from the second hand market. The short replacement cycles are probably driving the growth of second hand markets. Moreover, with online market places we expect the volumes to increase in the future.

The demand and use of mobile phones is ubiquitous especially among the urban youth. The general consumption patterns seem to be maturing with users willing to pay a premium for preferred features. The availability of online resources is reducing information asymmetries in both primary and secondary markets. The neutrality of platforms that provide information, advertise and sell mobile phones is important for the industry to maintain competitive outcomes. The following concluding section ties together our findings from both primary and secondary data and offers policy recommendations.

## 4. Conclusions and Policy Recommendations

Mobile phones in India have witnessed a tremendous uptake. These pocket sized devices are fast replacing computers to become the most widely used means of Internet access, particularly in emerging economies such as India. As innovations continue to increase the application of technology to daily life, its adoption is gradually becoming a metric of human progress. The mobile industry contributed 6.5% (\$140 billion) to India's GDP in 2015 and this is projected to increase to 8.2% by 2020.<sup>135</sup> More than 120 manufacturing units have created 450,000 jobs in the mobile phone industry since 2014.<sup>136</sup> The overall ecosystem for handsets and services combined is rapidly evolving.

For an industry with low entry and exit barriers, the entry of Chinese brands has transformed the handset industry in India. With features like bigger screens, improved user interface, local language support, along with lower prices and enormous marketing support; these brands have won over Indian consumers.<sup>137</sup> Samsung retained its position of dominance for five years, weathering massive disruptions in mobile phone form factors, consumer purchase behaviour and challenge from several competitors.<sup>138</sup> With a 259% growth rate in 2017, Xiaomi replaced Samsung as the market leader for the last quarter of 2017.<sup>139</sup> Chinese brands have also shifted customer buying behaviour from offline to online<sup>140</sup> and continue to compete aggressively in price segments that used to be dominated by local Indian brands or global brands like Samsung.<sup>141</sup> This study tries to capture effects on competition for India's mobile handset industry and identify trends that might impede its growth in the future. Our analysis provides perspectives using secondary data on sales of mobile phones and a primary survey of consumers on buying behaviour for mobile phones.

From 2007, competition has steadily increased in the mobile handset industry in India. New brands flooded the Indian market leading to levels of hyper competition. Since 2016, firms unable to sustain such competition exited, leading to consolidation and subsequent increase in market concentration ratios. Moreover, the level of competition also varies across different sub-markets. Our results

from secondary data analysis show that the market for premium phones is relatively more concentrated. While the low- and medium-priced segments observe frequent entry and exit of manufacturers there are relatively fewer manufacturers in the premium segment. Findings from our primary survey also find that demand for mobile phones in India is predominantly driven by the mid-range category, encouraging manufacturers to focus on this segment. The Product Market Differentiation (PMD) index estimates find that the market for 4G phones are relatively less heterogeneous in terms of number of differentiated models, alternatively these submarkets are less rivalrous than the homogenous markets for older generation. The survey findings also report a willingness to pay for improved features and user experience. The possibility of innovations in 4G handsets invites new entrants to this segment, reportedly one with higher industrial churn, compared to the relatively static 2G and 2.5G markets, which most brands are now exiting. Based on this analysis, we find evidence for continuous innovations in horizontal features of mobile phones, which based on literature, is a positive determinant of competition in the market.

The mobile industry in India is rapidly evolving. Taking advantage of the low entry and exit barriers, the entry of Chinese brands transformed the domestic handset industry. The mobile handset industry displays healthy competition, with no immediate concern about exercise of market power by any one entity. At the same time a high proportion of irrelevant firms exists that could either grow to be competitive threats in the future or just fall by the wayside. It is essential that policy interventions allow for incentives to develop long term innovation capabilities within the larger set of manufacturers in the industry. Substantive value addition as proposed under the National Electronics Policy (NEP) 2019 will also limit cases of hit and run entry, which are prominent within certain sub-segments. Policies must be developed to support research capabilities in newer technology generations.

Competition analysis must be linked to other changes in buying behaviour such as the choice of online formats over brick and mortar stores. The survey results also indicate an increasing trend towards use of online resources for pre-purchase research on mobile phones. While technology helps disintermediate by minimizing the levels of information asymmetry, the use of such platforms must be built on principles of neutrality as they are likely to influence demand patterns in the future. Moreover, our survey results find that consumers turn to the thriving secondary market for mobile phones to meet their constant needs for upgraded technology and user experiences at discounted prices. India's price sensitive market is now maturing towards becoming technology sensitive. The role of online platforms is only expected to increase in times to come.

While the industry has seen much progress, both technologically as well as behaviourally, a large part of the population is still to benefit from the use of mobile phones, especially in the light of the push towards digital India. The government has increased its focus on domestic manufacturing of mobile phones, not only to address underpenetration of technology but to limit its reliance on imported technology and imported products.

To encourage domestic manufacturing of mobile phones, India has now liberalised FDI norms and under the revised policy, foreign investment in manufacturing will be automatically approved and companies will be able to sell products produced through wholesale and retail routes, including e-commerce, without requiring prior government permission. Mobile handset manufacturing is a focus area under the government's Make in India initiative. The government's phased manufacturing program (PMP) is also aimed to promote indigenous manufacturing of cellular mobile handsets, its sub-assemblies and parts/sub-parts to establish a robust manufacturing ecosystem in India. The government's target under the Digital India program is to have net zero imports of electronics by 2020. As a step towards this, Budget 2018-19, increased customs duties from 15% to 20% on specific mobile parts. Import duties on chargers, adapters, battery packs, microphones, wired headsets, keypads, antenna, side-keys, and USB

cables, were increased from 7.5% or 10% to 15%. Similarly, import duty on printed circuit boards (PCBs) has also been levied at 10%. Some manufacturers have forayed into the assembly of PCBs and the target for 2019-20 is to begin assembly of displays and touch glass. However, for these objectives to be realised, significant investments are required to develop the necessary infrastructure that will support domestic manufacturing of components and spare parts in the future.

However, India's experience with import substitution policies that prevailed in the decades before liberalisation was inimical to fostering industrialization. On the other hand, Japan and Korea have demonstrated that industrial policies with sunset clauses can have pro industrialisation impacts. It must be recognized that protectionist measures are a double edged sword. For making India a manufacturing hub for mobile handsets, investments in R&D are necessary. Not more than a handful of mobile technology patents have been filed in India. Building design capacity will be an important component of achieving self-reliance in the mobile handset industry, along with other horizontal reforms such as access to infrastructure and ease of doing business.

Economies of scale and the presence of a mature ecosystem, continue to enable the low cost of production for mobile phones in China.<sup>142</sup> Even though several contract manufacturers from Taiwan, Korea and China are looking at India, the feasibility of manufacturing core components such as chipsets remain distant.<sup>143</sup> The government has to undertake measures to develop adequate infrastructure and policy incentives to progressively transform India into a large scale manufacturing ecosystem.<sup>144</sup> In this respect Vietnam has stolen by a march over India by offering lower tax rates, comparable wage rates and lower overall costs of doing business. The advantage of a large market size that India has, and will continue to possess, is often offset by these other disability costs including the uncertainties of transacting business.

NITI Aayog has set up a committee on how to jump-start India's exports of mobile phones in particular and electronics in general<sup>145</sup>. The committee was

created in the backdrop of the failure of India's phased-manufacturing-programme (PMP) for mobiles. The objective is not to alienate foreign manufacturers, but to build domestic capability that will enable sustainable growth with the added benefit of local job creation. The perennial debate on industrial policy will arise –whether supporting a specific sector is just or efficacious. Or should the policy simply aim to lower the overall cost of doing business and let the market choose the sectoral

focus. Also in this context, India must seriously evaluate the need to host a semi-conductor fabrication unit if the objective is to boost electronics in general.

India's potential lies in addressing the under-served demand of nearly half a billion people, and the constant need for up gradation from the other half. Collaborative steps by the government and industry can help build domestic capacity while maintaining healthy levels of competition.





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27. Semi Knocked Down (SKD) originates from the automobile and automotives manufacturing industries. In this process, a vehicle is partially disassembled by the manufacturer at the origin and reassembled in another country. (*Source* - <https://carbiketech.com/automotive-manufacturing-cbu-ckd-skd/>)
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# Appendix

## Appendix 1

### Table A1.1: Samsung Feature Mapping

[illegible]



Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier	
Samsung		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	No	N/A	0.6	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	No	N/A	0.6	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	No	N/A	0.6	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	No	N/A	0	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	No	N/A	0	Bar	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$25 - \$75	CDMA 2000 1xRTT	RTOS	N/A	No	N/A	0.1	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	No	N/A	1.2	Clamshell	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	04: 3MP<4MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samsung		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	04: 3MP<4MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	04: 3MP<4MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$75	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$25 - \$100	CDMA 2000 1xRTT	RTOS	N/A	No	N/A	0	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samsung		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	No	N/A	0	Clamshell	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	No	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	No	N/A	0	Clamshell	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$75 - \$100	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samsung	2018	Regular Smartphone	4G	\$75 - \$100	TD/FD-LTE Advanced	Android Nougat	N/A	No	N/A	0	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Smartphone	4G	\$100	TD/FD-LTE Advanced	Android Nougat	N/A	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	06: 5MP<6MP	03: 1.2GHz<1.4	1	4.7	'16 : 9	OLED	N/A	No	N/A	Ultra Low-End	

Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier
Samsung	2008						7.0								GHz								
		Regular Smartphone	4G	\$75 - \$100	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	09: 8MP<9MP	03: 1.2GHz<1.4 GHz	2	5	'16 : 9	LCD	N/A	No	No	Ultra Low-End
		Regular Smartphone	4G	\$75 - \$100	TD/FD-LTE Advanced	Android	Android Lollipop 5.1	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	06: 5MP<6MP	03: 1.2GHz<1.4 GHz	1	4.3	'5 : 3	LCD	N/A	No	No	Ultra Low-End
		Regular Smartphone	4G	\$75 - \$100	TD/FD-LTE Advanced	Android	Android Lollipop 5.1	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	06: 5MP<6MP	03: 1.2GHz<1.4 GHz	1	4.7	'16 : 9	OLED	N/A	No	No	Ultra Low-End
		Regular Smartphone	4G	\$75 - \$100	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	06: 5MP<6MP	03: 1.2GHz<1.4 GHz	1	4.7	'16 : 9	OLED	N/A	No	No	Ultra Low-End
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	No	N/A	0	Bar	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0.1	Bar	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	01: VGA (<1MP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	CDMA 2000 1xRTT	RTOS	N/A	No	N/A	0	Bar	No	Alphanumeric	No Camera	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$100 - \$125	GPRS/EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samsung	2018	Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Nougat 7.1	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	2	5	'16 : 9	OLED	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	1.5	5	'16 : 9	LCD	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	2	5	'16 : 9	OLED	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Lollipop 5.1	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	1.5	5	'16 : 9	OLED	N/A	No	No	Low-End

Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier
Samsung	2008	Phablet	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	03: 1.2GHz<1.4 GHz	2	5.5	'16 : 9	LCD	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	1.5	5	'16 : 9	LCD	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	2	5	'16 : 9	OLED	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Lollipop 5.1	Yes	Dual Standby	8	Full Screen	Yes	Touchscreen	09: 8MP<9MP	04: 1.4GHz<1.6 GHz	1.5	5	'16 : 9	OLED	N/A	No	No	Low-End
		Regular Smartphone	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	09: 8MP<9MP	03: 1.2GHz<1.4 GHz	2	5	'16 : 9	LCD	N/A	No	No	Low-End
		Phablet	4G	\$100 - \$125	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	03: 1.2GHz<1.4 GHz	2	5.5	'16 : 9	LCD	N/A	No	No	Low-End
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	3G	\$125 - \$150	WCDMA/ HSPA	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samsung	2018	Feature Phone	3G	\$125 - \$150	WCDMA/ HSPA	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Clamshell	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$125 - \$150	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Phablet	4G	\$125 - \$150	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	04: 1.4GHz<1.6 GHz	2	5.5	'16 : 9	OLED	N/A	No	No	Low-End
		Phablet	4G	\$125 - \$150	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	2	5.5	'16 : 9	OLED	N/A	No	No	Low-End
		Phablet	4G	\$125 - \$150	TD/FD-LTE	Android	Android Marshmallow	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End

Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier	
Samsung	2018						allow 6.0								GHz									
		Phablet	4G	\$125 - \$150	TD/FD-LTE	Android	Android Nougat 7.1	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End	
		Regular Smartphone	4G	\$125 - \$150	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	03: 1.2GHz<1.4 GHz	2	5.2	'16 : 9	OLED	N/A	No	No	Low-End	
		Phablet	4G	\$125 - \$150	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	2	5.5	'16 : 9	OLED	N/A	No	No	Low-End	
		Phablet	4G	\$125 - \$150	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	2	5.5	'16 : 9	OLED	N/A	No	No	Low-End	
		Feature Phone	2.5G	\$175	3GPRS/ EDGE	RTOS	N/A	Yes	N/A	0.1	Slider	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$175	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Feature Phone	2.5G	\$175	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	02: 1MP<2MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		Phablet	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	04: 1.4GHz<1.6 GHz	3	5.5	'16 : 9	OLED	N/A	No	No	Low-End	
		Regular Smartphone	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	04: 1.4GHz<1.6 GHz	3	5	'16 : 9	LCD	N/A	No	Yes	Low-End	
Samsung	2018	Phablet	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	No	Low-End	
		Phablet	4G	\$150 - \$175	TD/FD-LTE	Android	Android Nougat	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	4	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End	
		Regular Smartphone	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	04: 1.4GHz<1.6 GHz	2	5	'16 : 9	LCD	N/A	No	Yes	Low-End	
		Regular Smartphone	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	04: 1.4GHz<1.6 GHz	3	5	'16 : 9	LCD	N/A	No	Yes	Low-End	
		Phablet	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	N/A	No	No	Low-End
		Phablet	4G	\$150 - \$175	TD/FD-LTE	Android	Android Marshm allow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	N/A	No	No	Low-End
		Phablet	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	N/A	No	No	Low-End
		Phablet	4G	\$150 - \$175	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	N/A	No	No	Low-End
		Phablet	4G	\$150 - \$175	TD/FD-LTE	Android	Android Marshm allow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	N/A	No	Yes	Low-End
		Phablet	4G	\$150 - \$175	TD/FD-LTE	Android	Android Marshm allow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	N/A	No	Yes	Low-End

Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier
				\$175			Nougat 7.1		Standby						13MP<14MP	1.6GHz<1.8 GHz							
Samsung		Feature Phone	2.5G	\$175 - \$200	GPBS/ EDGE	RTOS	N/A	Yes	N/A	0.1	Slider	No	Alphanumeric	03:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$175 - \$200	GPBS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$175 - \$200	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	03:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	3G	\$175 - \$200	WCDMA/ HSPA	RTOS	N/A	Yes	N/A	1	Bar	No	Alphanumeric	04:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$175 - \$200	GPBS/ EDGE	RTOS	N/A	Yes	N/A	0.1	Bar	No	Alphanumeric	03:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$175 - \$200	GPBS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
				\$175 - \$200	GPBS/ EDGE	RTOS	N/A	Yes	N/A	0	Bar	No	Alphanumeric	2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.6	'18.5 : 9	OLED	N/A	No	Yes	Low-End
Samsung		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	4	5.7	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	4	5.6	'18.5 : 9	OLED	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	16	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Marshmallow 6.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	Yes	Low-End
Samsung		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.1	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	4	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.1	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	LCD	N/A	No	Yes	Low-End
		Phablet	4G	\$175 - \$200	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14:	1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	Yes	Low-End





Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier
Samsung	2008	Phablet	4G	\$200 - \$300	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Phablet	4G	\$200 - \$300	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	4	6	'18.5 : 9	OLED	N/A	Yes	Yes	Mid-Range
		Phablet	4G	\$200 - \$300	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	4	5.5	'16 : 9	OLED	N/A	Yes	Yes	Mid-Range
		Phablet	4G	\$200 - \$300	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	32	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	4	5.7	'16 : 9	LCD	N/A	No	Yes	Mid-Range
		Phablet	4G	\$200 - \$300	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	14: 13MP<14MP	05: 1.6GHz<1.8 GHz	3	5.5	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Feature Phone	2.5G	\$300 - \$400	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric + Touchscreen	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$300 - \$400	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0.2	Slider	No	Alphanumeric	06: 5MP<6MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Regular Smartphone	3G	\$300 - \$400	WCDMA/ HSPA	Others	N/A	Yes	N/A	0	Bar	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Mid-Range
		Feature Phone	3G	\$300 - \$400	WCDMA/ HSPA	RTOS	N/A	Yes	N/A	0.1	Slider	No	Alphanumeric	06: 5MP<6MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	3G	\$300 - \$400	WCDMA/ HSPA	RTOS	N/A	Yes	N/A	0.2	Full Screen	No	Touchscreen	06: 5MP<6MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Feature Phone	2.5G	\$300 - \$400	GPRS/ EDGE	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric	04: 3MP<4MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samsung	2018	Regular Smartphone	3G	\$300 - \$400	WCDMA/ HSPA	Others	N/A	Yes	N/A	0	Slider	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Mid-Range
		Regular Smartphone	3G	\$300 - \$400	WCDMA/ HSPA	Others	N/A	Yes	N/A	0	Slider	No	Alphanumeric	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Mid-Range
		Feature Phone	2.5G	\$300 - \$400	CDMA 2000 1xRTT	RTOS	N/A	Yes	N/A	0	Slider	No	Alphanumeric + Touchscreen	03: 2MP<3MP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	4	6	'18.5 : 9	OLED	N/A	Yes	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Nougat 7.1	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	07: 2.0GHz<2.3 GHz	6	6	'18.5 : 9	OLED	IP68	No	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	6	6	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	07: 2.0GHz<2.3 GHz	4	5.7	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	6	6	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	6	6	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	6	6	'16 : 9	OLED	N/A	No	Yes	Mid-Range
		Phablet	4G	\$300 - \$400	TD/FD-LTE Advanced	Android	Android Marshm allow 6.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	17: 16MP<17MP	06: 1.8GHz<2.0 GHz	6	6	'16 : 9	OLED	N/A	No	Yes	Mid-Range



Brand	Year	Product Detail	Generation	Price Band	Air Interface	Operating System	OS Version	Bluetooth	Dual SIM	Storage (GB)	Form Factor	GPS	Input Method	Megapixels Band	Processor Speed Band	RAM (GB)	Screen Size	Aspect Ratio	Display Type	Waterproofing	Dual Rear Camera	Fingerprint Reader	Smartphone Tier
Samsung	2018	Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.1	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.3	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	6.2	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	128	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	128	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	256	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	128	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Oreo 8.0	Yes	Dual Standby	256	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.1	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.3	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	6.2	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	6.2	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	128	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	256	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	128	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	256	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	6	6.2	'18.5 : 9	OLED	IP68	Yes	Yes	Ultra High-End
		Phablet	4G	> \$700	TD/FD-LTE Advanced	Android	Android Nougat 7.0	Yes	Dual Standby	64	Full Screen	Yes	Touchscreen	13: 12MP<13MP	08: 2.3+GHz	4	5.8	'18.5 : 9	OLED	IP68	No	Yes	Ultra High-End

Source: Compiled by authors from IDC's Quarterly Mobile Phone Tracker, 2018Q2

## Appendix 2

**Table A2.1: Price-band wise Numbers Equivalent and Irrelevant Brands**

Price Band	Measure	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
< \$25	Numbers Equivalent	1	6	6	3	5	15	11	9	8	7	8	3
	Number of Irrelevant Brands	5	5	7	12	20	16	22	27	19	19	14	14
	Proportion of Irrelevant Brands	76%	46%	53%	79%	80%	53%	67%	76%	72%	73%	66%	83%
\$25 - \$75	Numbers Equivalent	3	3	4	7	6	4	5	6	8	9	9	6
	Number of Irrelevant Brands	12	16	21	23	26	31	26	29	29	21	22	18
	Proportion of Irrelevant Brands	81%	86%	86%	77%	80%	87%	82%	83%	79%	70%	70%	76%
\$75 - \$100	Numbers Equivalent	3	2	2	6	3	3	4	6	5	11	4	4
	Number of Irrelevant Brands	7	14	20	17	17	15	21	25	31	22	31	22
	Proportion of Irrelevant Brands	66%	86%	90%	73%	87%	85%	84%	80%	85%	65%	88%	86%
\$100 - \$125	Numbers Equivalent	3	2	2	3	2	2	5	7	6	4	7	5
	Number of Irrelevant Brands	6	11	11	13	12	12	19	22	26	28	28	20
	Proportion of Irrelevant Brands	67%	87%	81%	82%	84%	85%	81%	75%	80%	86%	80%	82%
\$125 - \$150	Numbers Equivalent	2	3	3	3	3	6	7	4	6	6	7	6
	Number of Irrelevant Brands	6	7	11	8	8	9	18	20	24	18	18	15
	Proportion of Irrelevant Brands	71%	70%	81%	77%	71%	63%	73%	84%	80%	77%	73%	72%
\$150 - \$175	Numbers Equivalent	3	2	4	2	3	6	3	6	5	6	4	4
	Number of Irrelevant Brands	4	10	6	6	8	10	17	18	19	20	21	12
	Proportion of Irrelevant Brands	64%	80%	61%	70%	76%	65%	84%	76%	77%	77%	84%	73%
\$175 - \$200	Numbers Equivalent	3	2	3	2	4	2	4	5	6	3	3	4
	Number of Irrelevant Brands	2	9	6	4	5	8	10	16	16	16	19	12
	Proportion of Irrelevant Brands	45%	83%	66%	61%	57%	78%	73%	78%	73%	82%	87%	76%
\$200 - \$300	Numbers Equivalent	2	2	3	3	5	6	3	5	4	6	4	3
	Number of Irrelevant Brands	8	10	8	9	9	9	15	20	21	16	20	14
	Proportion of Irrelevant Brands	81%	82%	76%	73%	67%	61%	85%	81%	86%	75%	82%	81%
\$300 - \$400	Numbers Equivalent	3	3	1	3	3	3	3	4	5	5	5	3
	Number of Irrelevant Brands	9	11	13	11	8	8	8	12	12	11	8	7
	Proportion of Irrelevant Brands	72%	82%	91%	78%	69%	70%	71%	74%	71%	67%	63%	67%
\$400 - \$500	Numbers Equivalent	3	2	3	4	4	4	2	5	2	1	3	2
	Number of Irrelevant Brands	9	10	6	6	6	4	7	8	10	9	6	5
	Proportion of Irrelevant Brands	77%	83%	62%	55%	60%	55%	82%	58%	84%	85%	68%	72%
\$500 - \$700	Numbers Equivalent	3	4	4	3	5	1	5	3	3	2	2	3
	Number of Irrelevant Brands	8	9	7	7	5	6	3	6	6	8	8	5
	Proportion of Irrelevant Brands	77%	70%	68%	66%	48%	79%	44%	69%	69%	77%	79%	61%
> \$700	Numbers Equivalent	2	3	3	2	1	1	3	2	2	1	2	2
	Number of Irrelevant Brands	5	6	1	1	0	2	3	4	5	7	3	3
	Proportion of Irrelevant Brands	74%	66%	27%	22%	0%	65%	48%	69%	73%	82%	61%	69%

Source: Authors' calculations using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

Appendix 3

Segment 1 – Feature Phones, Phablets and Regular Smartphones

Table A3.1: Concentration Indices by Type of Phone

Year	C4 Concentration Ratio			Herfindahl - Hirschman Index			Ginevicius Index			GRS Index			Entropy Index		
	Feature Phone	Phablet	Regular Smartphone	Feature Phone	Phablet	Regular Smartphone	Feature Phone	Phablet	Regular Smartphone	Feature Phone	Phablet	Regular Smartphone	Feature Phone	Phablet	Regular Smartphone
2007	0.80		0.96	0.29		0.70	0.08		0.27	0.49		0.82	1.70		0.74
2008	0.85		0.91	0.38		0.56	0.09		0.16	0.60		0.74	1.55		1.05
2009	0.74		0.96	0.29		0.59	0.05		0.16	0.51		0.75	1.93		0.95
2010	0.70		0.90	0.15		0.38	0.04		0.09	0.27		0.57	2.34		1.38
2011	0.75		0.86	0.20		0.22	0.04		0.06	0.35		0.34	2.14		1.76
2012	0.72	1.00	0.74	0.20	0.99	0.26	0.03	0.99	0.04	0.33	0.93	0.47	2.27	0.02	1.92
2013	0.75	0.96	0.68	0.19	0.77	0.20	0.04	1.00	0.04	0.36	0.86	0.40	2.16	0.62	2.25
2014	0.69	0.68	0.60	0.16	0.15	0.15	0.03	0.95	0.03	0.32	0.30	0.34	2.22	2.32	2.49
2015	0.68	0.66	0.60	0.15	0.21	0.14	0.04	0.96	0.02	0.25	0.43	0.32	2.19	2.26	2.62
2016	0.68	0.62	0.54	0.16	0.16	0.12	0.04	0.98	0.02	0.33	0.35	0.27	2.19	2.45	2.69
2017	0.65	0.73	0.58	0.16	0.18	0.11	0.05	0.94	0.02	0.31	0.33	0.20	2.21	2.16	2.61
2018	0.83	0.80	0.65	0.32	0.23	0.13	0.08	0.97	0.03	0.53	0.40	0.24	1.66	1.94	2.41

Source: Authors' calculations using IDC's Quarterly Mobile Phone Tracker, 2018Q2

Segment 2 – Price Bands

Table A3.2: Concentration Indices by Price Bands

C4												
Price Band	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
< \$25	0.99	0.74	0.74	0.81	0.72	0.42	0.52	0.61	0.66	0.67	0.63	0.82
\$25-\$75	0.78	0.83	0.76	0.66	0.70	0.78	0.78	0.73	0.68	0.61	0.56	0.72
\$75-\$100	0.87	0.86	0.80	0.75	0.91	0.94	0.83	0.67	0.70	0.49	0.78	0.78
\$100-\$125	0.88	0.94	0.90	0.90	0.97	0.95	0.78	0.64	0.66	0.67	0.66	0.84
\$125-\$150	0.98	0.88	0.93	0.97	0.91	0.74	0.66	0.77	0.66	0.71	0.74	0.79
\$150-\$175	0.98	0.89	0.90	0.95	0.96	0.79	0.86	0.79	0.70	0.73	0.87	0.81
\$175-\$200	1.00	0.90	0.98	0.99	0.92	0.94	0.87	0.69	0.72	0.75	0.85	0.88
\$200-\$300	0.96	0.95	0.90	0.92	0.84	0.74	0.86	0.72	0.74	0.73	0.85	0.92
\$300-\$400	0.93	0.88	0.97	0.92	0.91	0.88	0.87	0.84	0.78	0.81	0.83	0.97
\$400-\$500	0.91	0.92	0.91	0.87	0.94	0.88	0.93	0.81	0.90	0.98	0.98	0.90
\$500-\$700	0.95	0.91	0.88	0.88	0.84	0.97	0.87	0.93	0.92	0.97	0.93	0.94
> \$700	0.96	0.93	1.00	1.00	1.00	1.00	0.94	0.99	0.99	0.99	1.00	1.00

HHI												
Price Band	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
< \$25	0.71	0.17	0.17	0.32	0.20	0.07	0.09	0.11	0.13	0.14	0.13	0.35
\$25-\$75	0.35	0.38	0.28	0.14	0.15	0.22	0.18	0.17	0.13	0.11	0.11	0.18
\$75-\$100	0.30	0.43	0.46	0.16	0.38	0.36	0.25	0.16	0.18	0.09	0.23	0.28
\$100-\$125	0.34	0.60	0.41	0.34	0.44	0.49	0.22	0.14	0.16	0.23	0.14	0.22
\$125-\$150	0.43	0.34	0.38	0.39	0.31	0.18	0.15	0.26	0.16	0.18	0.15	0.17
\$150-\$175	0.39	0.41	0.25	0.42	0.38	0.18	0.31	0.18	0.18	0.17	0.25	0.23
\$175-\$200	0.36	0.53	0.32	0.42	0.26	0.46	0.27	0.21	0.17	0.29	0.35	0.26
\$200-\$300	0.53	0.45	0.38	0.31	0.22	0.17	0.36	0.22	0.28	0.18	0.23	0.32
\$300-\$400	0.30	0.40	0.78	0.33	0.29	0.30	0.31	0.24	0.20	0.19	0.21	0.30
\$400-\$500	0.36	0.49	0.29	0.22	0.25	0.28	0.63	0.18	0.53	0.67	0.35	0.52
\$500-\$700	0.39	0.26	0.28	0.29	0.19	0.69	0.22	0.36	0.36	0.43	0.48	0.32
> \$700	0.55	0.33	0.34	0.43	1.00	0.94	0.32	0.54	0.52	0.69	0.52	0.64
Ginevicius Index												
Price Band	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
< \$25	0.44	0.10	0.08	0.10	0.05	0.03	0.03	0.03	0.04	0.04	0.05	0.09
\$25-\$75	0.10	0.09	0.06	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.03	0.05
\$75-\$100	0.13	0.12	0.10	0.05	0.08	0.08	0.05	0.04	0.03	0.03	0.04	0.05
\$100-\$125	0.16	0.21	0.13	0.09	0.12	0.14	0.05	0.04	0.04	0.04	0.03	0.05
\$125-\$150	0.20	0.14	0.11	0.13	0.12	0.08	0.05	0.06	0.04	0.05	0.05	0.05
\$150-\$175	0.21	0.14	0.12	0.19	0.13	0.07	0.07	0.05	0.05	0.05	0.05	0.08
\$175-\$200	0.25	0.20	0.14	0.23	0.13	0.18	0.09	0.06	0.05	0.08	0.07	0.08
\$200-\$300	0.21	0.15	0.14	0.11	0.09	0.08	0.09	0.05	0.06	0.05	0.05	0.08
\$300-\$400	0.11	0.12	0.34	0.10	0.12	0.12	0.13	0.08	0.07	0.07	0.09	0.13
\$400-\$500	0.12	0.17	0.14	0.12	0.12	0.15	0.29	0.09	0.19	0.29	0.15	0.27
\$500-\$700	0.14	0.10	0.12	0.13	0.11	0.40	0.14	0.16	0.15	0.16	0.19	0.16
> \$700	0.28	0.15	0.28	0.38	1.00	0.90	0.20	0.31	0.25	0.36	0.32	0.40
GRS Index												
Price Band	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
< \$25	0.82	0.23	0.24	0.53	0.38	0.15	0.16	0.18	0.18	0.26	0.25	0.57
\$25-\$75	0.57	0.60	0.50	0.28	0.30	0.38	0.32	0.32	0.19	0.17	0.19	0.34
\$75-\$100	2.08	1.57	1.49	3.85	1.91	2.21	2.38	3.60	3.06	6.58	2.67	2.07
\$100-\$125	0.54	0.76	0.61	0.43	0.52	0.64	0.38	0.28	0.32	0.44	0.26	0.36
\$125-\$150	7.92	9.95	13.94	10.94	10.96	14.98	24.99	23.96	29.98	23.98	24.99	20.99
\$150-\$175	0.57	0.61	0.40	0.59	0.45	0.26	0.50	0.28	0.36	0.31	0.40	0.37
\$175-\$200	0.49	0.71	0.40	0.48	0.33	0.65	0.43	0.42	0.31	0.51	0.56	0.35
\$200-\$300	0.70	0.63	0.58	0.49	0.33	0.28	0.57	0.42	0.51	0.35	0.37	0.50
\$300-\$400	0.40	0.60	0.87	0.50	0.45	0.49	0.51	0.40	0.37	0.29	0.32	0.43
\$400-\$500	0.54	0.67	0.43	0.35	0.34	0.45	0.78	0.28	0.71	0.80	0.45	0.70
\$500-\$700	0.57	0.39	0.45	0.47	0.23	0.81	0.31	0.51	0.48	0.52	0.66	0.47
> \$700	0.71	0.49	0.44	0.58	1.00	0.92	0.40	0.70	0.65	0.81	0.65	0.75



Entropy Index													
Price Band	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
< \$25	0.63	1.92	1.94	1.63	2.14	2.96	2.74	2.45	2.28	2.26	2.29	1.60	
\$25-\$75	1.62	1.58	1.95	2.39	2.33	2.07	2.08	2.18	2.37	2.49	2.47	2.14	
\$75-\$100	1.56	1.40	1.48	2.17	1.33	1.29	1.85	2.30	2.23	2.71	2.00	1.84	
\$100-\$125	1.46	0.95	1.36	1.42	1.04	1.04	1.98	2.41	2.33	2.15	2.42	1.89	
\$125-\$150	1.13	1.47	1.33	1.15	1.44	1.98	2.38	1.94	2.31	2.16	2.16	2.06	
\$150-\$175	1.20	1.35	1.60	1.19	1.22	1.89	1.66	2.07	2.19	2.04	1.74	1.59	
\$175-\$200	1.14	1.10	1.23	1.00	1.49	1.18	1.65	2.11	2.16	1.83	1.61	1.62	
\$200-\$300	0.99	1.15	1.39	1.48	1.76	1.98	1.53	2.14	1.95	2.15	1.85	1.47	
\$300-\$400	1.43	1.36	0.56	1.42	1.52	1.58	1.55	1.75	1.91	1.99	1.84	1.39	
\$400-\$500	1.37	1.11	1.50	1.69	1.18	1.55	0.90	1.93	1.13	0.72	1.24	1.10	
\$500-\$700	1.25	1.59	1.56	1.55	1.73	0.72	1.67	1.33	1.32	1.04	1.12	1.39	
> \$700	0.98	1.39	1.15	0.97	0.00	0.09	1.33	0.88	0.81	0.63	0.82	0.60	

Source: Authors' calculations using IDC's Quarterly Mobile Phone Tracker, 2018Q2

### Segment 3 – Technology Generations

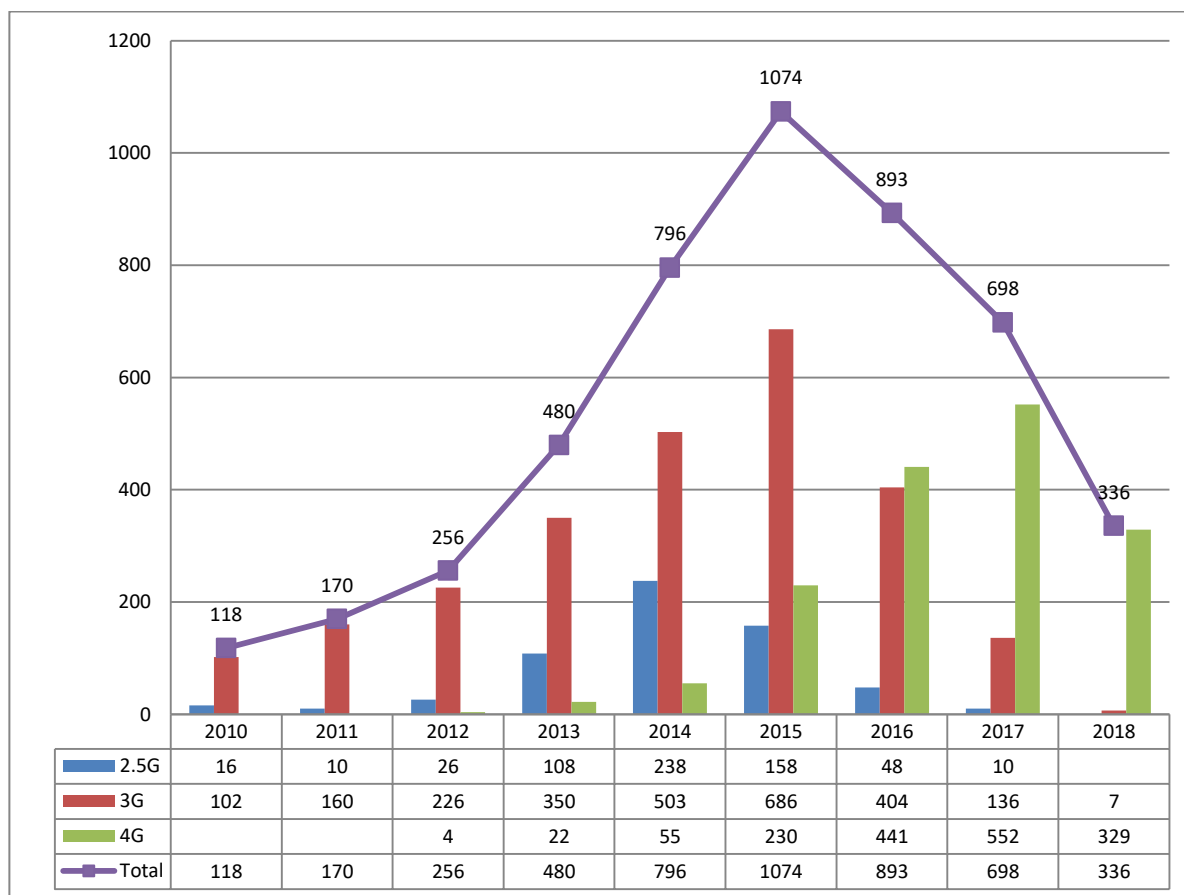
**Table A3.3: Concentration Indices by Technology Generation**

Year	C4 Concentration Ratio				Herfindahl - Hirschman Index				Ginevicius Index				GRS Index				Entropy Index			
	2G	2.5G	3G	4G	2G	2.5G	3G	4G	2G	2.5G	3G	4G	2G	2.5G	3G	4G	2G	2.5G	3G	4G
2007	0.94	0.77	0.99		0.64	0.24	0.71		0.25	0.05	0.36		0.79	0.40	0.82		0.89	1.85	0.64	
2008	0.94	0.81	0.95		0.61	0.32	0.61		0.21	0.06	0.20		0.77	0.52	0.76		0.93	1.75	0.90	
2009	0.95	0.69	0.95		0.67	0.22	0.52		0.22	0.04	0.15		0.80	0.43	0.70		0.83	2.20	1.05	
2010	0.85	0.69	0.87		0.48	0.14	0.27		0.09	0.04	0.07		0.68	0.22	0.45		1.36	2.40	1.63	
2011	0.92	0.70	0.87		0.49	0.17	0.24		0.10	0.03	0.06		0.68	0.28	0.37		1.24	2.31	1.69	
2012	0.75	0.69	0.81	1.00	0.27	0.17	0.30	0.90	0.05	0.03	0.05	0.83	0.48	0.26	0.51	0.90	1.96	2.41	1.74	0.21
2013	0.75	0.73	0.78	0.91	0.22	0.15	0.26	0.31	0.05	0.03	0.04	0.18	0.36	0.23	0.48	0.43	2.06	2.29	2.00	1.40
2014	0.75	0.66	0.62	0.84	0.22	0.13	0.15	0.26	0.04	0.03	0.03	0.09	0.39	0.20	0.33	0.36	1.99	2.33	2.47	1.72
2015	0.87	0.65	0.58	0.72	0.30	0.13	0.11	0.23	0.05	0.03	0.03	0.03	0.44	0.21	0.23	0.43	1.59	2.28	2.66	2.14
2016	0.73	0.67	0.59	0.59	0.19	0.15	0.11	0.14	0.05	0.05	0.03	0.03	0.35	0.28	0.22	0.32	2.05	2.22	2.55	2.52
2017	0.79	0.72	0.65	0.65	0.20	0.20	0.17	0.14	0.06	0.06	0.06	0.02	0.33	0.38	0.36	0.27	1.93	2.08	2.26	2.46
2018	0.84	0.75	0.99	0.70	0.21	0.19	0.41	0.17	0.08	0.07	0.26	0.03	0.30	0.34	0.51	0.31	1.83	2.03	1.05	2.27

Source: Authors' calculations using IDC's Quarterly Mobile Phone Tracker, 2018Q2

## Appendix 4

**FigureA4.1: Number of Phone Models across Technology Generations**



Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

### Table A4.1: Brand – Wise Number of Models for 2.5G Technology

[illegible]

Mobiistar													
Motorola				1									
MTS													
MWG													
Nokia				3	3	2	1						
Nubia													
O2													
Obi													
Olive													
OnePlus													
Onida								4	1				
Oppo													
Palm													
Panasonic								3	2				
Pantech													
QiKU													
RealMe													
Rocker													
Sagem													
Samsung				2	2	1	2	3	5				
Siemens													
Simputer (Encore)													
Sony													
Sony Ericsson													
Spektra													
Spice					1	1	7	17	12	7			
Swipe									2				
Tata Indicom													
TCL													
Tecno													
Usha-Lexus													
Videocon							1	10	14	6	4		
Virgin Mobile													
Vivo													
Vodafone													
VOTO													
Xiaomi													
XOLO								1					
YU													
Yxtel						2	5	4	7	4	2		
Zen							3	12	9				
ZTE													
ZUK													
Total				16	10	26	108	238	158	48	10	0	

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

### Table A4.2: Brand – Wise Number of Models for 3G Technology

Brand	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
10.or												
Acer				4	8	3		2	2	1		
Airfone												
Alcatel						4	13	16	7			
Apple				3	3	3	2	3	3			
Aroma												
ASUS						1	1	4	5	2	1	
BenQ Siemens												
Bird												
Blackberry				16	25	19	8	7	6			
Bleu												
Bloom								1	4			
Byond						1	5	1				
Carlvo												
Celkon						9	23	26	38	28	4	1
Classic												
Comio												
Coolpad				1		1	2	1				
Curitel												
Dallab												
Datawind								2	3	3	1	
Dell				3	3							
DoPod												
E-Ten												
Fly				1		2	6	1	6			
Forme								1	4			
Garmin				4	1							
G-Five						4	6	3	2			
Gigabyte												
Gild												
Gionee							12	20	18	17	5	1
GLX						1	1					
Gnine												
Google												
Haier												
Hi-Tech						1	3	4	13	6	3	
Honor						1		2	4	1		
HP								1	1			
HTC				16	19	25	22	14	13	4	2	
Huawei				2	8	7	12	11	6	1		
iBall							6	7	32	14		
Idea Cellular								1				
i-Mate												
Infinix												
Infocus									3	1		
Intex						2	8	23	86	63	20	
Itel										9	7	2
Karbons					1	11	32	56	52	24	13	
Kechao												
Kenxindia								1	15	8	10	
Krome												
Kyocera												
Lava					1	4	19	30	51	34	12	
LeEco												
Lemon						2	5	4	3			
Lenovo							20	22	6	2		
Lephone												
LG Electronics				4	9	11	12	15	9	1		
Lyf												
Maxx							3	9				
Meizu												
Micromax				1	5	15	29	52	82	62	12	
Microsoft								1	7	5		
Mio												



[illegible]

Brand	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rocker												
Sagem												
Samsung								10	23	37	38	37
Siemens												
Simputer (Encore)												
Sony							2	5	10	12	12	2
Sony Ericsson												
Spektra												
Spice									1		4	5
Swipe									1	5	15	9
Tata Indicom												
TCL										2	2	
Tecno											5	9
Usha-Lexus												
Videocon									1	10	7	5
Virgin Mobile												
Vivo									6	8	15	17
Vodafone												
VOTO											3	1
Xiaomi								1	5	10	14	14
XOLO									3	8	6	1
YU									5	7	8	
Yxtel												
Zen										3	18	6
ZTE									5		5	2
ZUK										2	1	
Total	0	0	0	0	0	4	22	55	230	441	552	329

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2



## Appendix 5

Table A5.1: Brand – Wise Industry Churn Analysis

Brand	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
10.or											4	4
Acer			2.5, 3	3	3	3		3	3, 4	3, 4	4	
Airfone					2.5						4	
Alcatel						2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	4	4	4
Apple		3	3	3	3	3, 4	3, 4	3, 4	3, 4	4	4	4
Aroma				2, 2.5	2, 2.5							
ASUS	3	2.5, 3	2.5, 3			3	3	3	3, 4	3, 4	3, 4	4
BenQ Siemens	2.5, 2											
Bird	2											
Blackberry	2.5, 3	2.5, 3	2.5, 3	2.5, 3	2.5, 3	2.5, 3	2.5, 3, 4	2.5, 3, 4	2.5, 3, 4	4	4	4
Bleu			2.5, 2									
Bloom						2.5	2.5	2, 2.5, 3	2, 2.5, 3			
Byond						2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3			
Carlovo					2.5	2, 2.5	2, 2.5	2, 2.5	2	2, 2.5		
Celkon					2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	2, 2.5, 3, 4	
Classic	2.5, 2	2.5	2.5									
Comio											4	4
Coolpad		2.5	2.5	2.5, 3	2.5	3	3	3	4	4	4	4
Datawind								3	2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	
Dell				3	3							
DoPod	2.5											
E-Ten	2.5	2.5										
Fly	2.5	2.5, 2	2.5, 2	2, 2.5, 3	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2.5, 3			
Forme				2, 2.5	2.5	2, 2.5	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5	2, 2.5	
Garmin			3	3	3							
G-Five			2.5	2, 2.5	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3			
Gigabyte			2.5, 3									
Gild				2, 2.5	2, 2.5	2, 2.5	2, 2.5	2, 2.5				
Gionee						2, 2.5	2, 2.5	2, 2.5	2.5, 3, 4	2.5, 3, 4	2.5, 3, 4	
GLX						2, 2.5, 3	2, 2.5, 3	2.5		2.5		
Gnine						2, 2.5	2, 2.5	2, 2.5				
Google										4	4	4
Haier	2.5, 2	2.5, 2	2.5, 2	2, 2.5	2, 2.5							
Hi-Tech				2, 2.5	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	2, 2.5, 3, 4	2, 2.5
Honor						3	3, 4	3, 4	3, 4		4	4
HP	2.5	2.5, 3	3	2.5				3	3			
HTC	2.5, 3	2.5, 3	2.5, 3	2.5, 3	3	3	3, 4	3, 4	3, 4	3, 4	3, 4	4



Brand	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Samsung	2.5	2.5, 2, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	2, 2.5, 3, 4	2, 2.5, 3, 4	2, 2.5, 3, 4	2, 2.5, 4
Sony						3	3, 4	3, 4	3, 4	3, 4	4	4
Sony Ericsson	2.5, 2, 3	2.5, 2, 3	2, 2.5, 3	2, 2.5, 3	2.5, 3	2.5, 3						
Spice	2.5, 2	2.5, 2	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	2, 2.5, 3	2.5, 4	2.5, 4
Swipe									2.5, 3, 4	3, 4	3, 4	3, 4
Tata Indicom		2.5	2.5		2.5							
TCL										4	4	
Tecno											4	4
Usha-Lexus	2.5, 2	2.5, 2	2.5	2, 2.5								
Videotcon					2, 2.5	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	2, 2.5, 3, 4	2, 2.5, 3, 4	2.5, 3, 4
Virgin Mobile				2.5					3, 4			
vivo			2.5						3, 4	3, 4	3, 4	4
Vodafone	2	2.5, 2	2, 2.5	2	2, 2.5							
VOTO											4	4
Xiaomi								3, 4	3, 4	4	4	4
XOLO						3	3	2.5, 3	3, 4	3, 4	4	4
YU									4	4	4	
Yxtel						2, 2.5	2, 2.5	2, 2.5	2, 2.5	2, 2.5, 3	2, 2.5, 3	
Zen			2.5	2, 2.5	2.5	2.5	2, 2.5	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4	2, 2.5, 3, 4	2, 2.5, 4
ZTE	2.5	2.5	2, 2.5	2, 2.5, 3	2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3	2, 2.5, 3, 4		4	4
ZUK										4	4	

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2.

**Table A5.1.1: Colour Codes**

	Exit
	Entry
	Continuing

Note: The numbers in the boxes represent the technology generation of the market segment where entry/exit/continuing sales took place

## Appendix 6

**Table A6.1: Brand – wise churn of 2.5G Technology Generation**

[illegible]

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

Company	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
10.or												
Acer												
Airfone												
Alcatel							Green	Yellow	Red			
Apple												
Aroma				Green	Red							
ASUS												
BenQ Siemens	Red											
Bird	Red											
Blackberry												
Bleu			Blue									
Bloom								Green	Red			
Byond						Green	Yellow	Red				

[illegible]

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

[illegible]

[illegible]



[illegible]

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

### Table A6.4: Brand – wise Churn for 4G Technology Generation

[illegible]

Company	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Kenxindia												
Krome												
Kyocera												
Lava												
LeEco												
Lemon												
Lenovo												
Lephone												
LG Electronics												
Lyf												
Maxx												
Meizu												
Micromax												
Microsoft												
Mio												
Mobiistar												
Motorola												
MTS												
MWG												
Nokia												
Nubia												
O2												
Obi												
Olive												
OnePlus												
Onida												
OPPO												
Palm												
Panasonic												
Pantech												
QiKU												
RealMe												
Rocker												
Sagem												
Samsung												
Siemens												
Simputer (Encore)												
Sony												
Sony Ericsson												
Spektra												
Spice												
Swipe												
Tata Indicom												
TCL												
Tecno												
Usha-Lexus												
Videocon												
Virgin Mobile												
Vivo												
Vodafone												
VOTO												
Xiaomi												
XOLO												
YU												
Yxtel												
Zen												
ZTE												
ZUK												

Source: Compiled by authors using data from IDC's Quarterly Mobile Phone Tracker, 2018Q2

## Appendix 7

### ICRIER Survey

#### Mobile Phone Consumer Preference Survey

1. City - \_\_\_\_\_
2. Age - \_\_\_\_\_
3. Gender
  - ☐ Male
  - ☐ Female
  - ☐ Other
4. Highest Level of Educational Qualification
  - ☐ MPhil/PhD
  - ☐ Post Graduation
  - ☐ Graduation
  - ☐ Sr. Secondary (upto class 12)
  - ☐ Secondary (upto class 10)
  - ☐ Upper Primary (upto class 8)
  - ☐ Primary (upto class 5)
  - ☐ Other (please specify) \_\_\_\_\_
5. Occupation
  - ☐ Employed with Private Sector
  - ☐ Employed with Public Sector
  - ☐ Employed with a Not-for-Profit
  - ☐ Business
  - ☐ Independent Professional (Lawyer/Doctor)
  - ☐ Student
  - ☐ Not seeking employment
  - ☐ Other (please specify) \_\_\_\_\_
6. Monthly income (Rs./month)
  - ☐ < 30,000
  - ☐ 30,000 – < 50,000
  - ☐ 50,000 – < 1,00,000
  - ☐ 1,00,000 – < 3,00,000
  - ☐ > 3,00,000
  - ☐ No income

7. What kind of mobile phone do you currently use? (The boundary between feature phones and smartphones is a bit fuzzy. Feature phones essentially allow voice calling, camera, basic internet access and apps with limited capabilities). Please select on the basis of your understanding.
- ☐ Smartphone (brand, model, price, year of purchase) - \_\_\_\_\_
  - ☐ Feature Phone (brand, model, price, year of purchase) - \_\_\_\_\_
  - ☐ Other (please specify) (brand, model, price, year of purchase) - \_\_\_\_\_
8. If you do not use a Smartphone currently, would you like to switch to one?
- ☐ Yes
  - ☐ No
9. If answer to Q8 is no, then please briefly give reasons:
- \_\_\_\_\_
10. How often do you buy a new mobile phone?
- ☐ Once a year
  - ☐ Once in 2 years
  - ☐ Once in 3 years
  - ☐ Other (please specify) - \_\_\_\_\_
11. Where do you mostly buy your mobile phone from?
- ☐ Online (e-commerce websites like Amazon, Flipkart, Snapdeal etc.)
  - ☐ Retail shops (eg: Croma)
  - ☐ Local mobile stores
  - ☐ Repurchase/Second-hand purchase
  - ☐ Other (please specify) - \_\_\_\_\_
12. Which is the most important among the following in influencing your purchase of a mobile phone?
- ☐ Online resources
  - ☐ Recommendations from family and friends
  - ☐ Recommendations by mobile stores
  - ☐ Other (please specify) - \_\_\_\_\_
13. Within which price bracket are you likely to purchase a new mobile phone (in Rupees)?
- ☐ < 2,500
  - ☐ 2,501 - 5,000
  - ☐ 5001 - 10,000
  - ☐ 10,001 - 20,000
  - ☐ 20,001 - 30,000
  - ☐ 30,001 - 50,000
  - ☐ > 50,000

14. How important are the following factors when considering purchase of a mobile phone? (Please rate on a scale of 1 - 5 where 1 is the lowest priority and 5 is the highest priority)

- ☐ Price
- ☐ Brand
- ☐ Operating System
- ☐ Service centre accessibility
- ☐ Technology support (3G/4G support)
- ☐ Other (please specify) \_\_\_\_\_

15. Please rate the features of a mobile phone based on how important they are to you. (Please rate each feature on a scale of 1-5 where, 1 is the least important and 5 is the most important)

- ☐ Battery life
- ☐ Screen size
- ☐ RAM and Processing speed
- ☐ Storage memory
- ☐ Camera resolution
- ☐ Vernacular support
- ☐ Operating system
- ☐ Audio quality
- ☐ Display resolution
- ☐ Other (please specify) \_\_\_\_\_

16. Between two phones, other features remaining the same, if the quality of one preferred feature (camera, battery etc.) is improved in a phone, would you be willing to pay more for that phone?

- ☐ Yes
- ☐ No

17. If yes, how much extra would you be willing to pay?

- ☐ < 10%
- ☐ Between 10% and 20%
- ☐ Between 20% and 50%
- ☐ > 50%

18. What do you mostly do with your old phones?

- ☐ Trade for a new phone
- ☐ Sell in the second hand market for phones
- ☐ Give away to family/charity
- ☐ Leave unused
- ☐ Recycle
- ☐ Other (please specify) \_\_\_\_\_

19. Would you buy a mobile phone from the second hand market?

- ☐ Yes
- ☐ No

20. If answer to Q19 is yes, then at what discount would you buy it?

- ☐ < 20%
- ☐ 20% - 40%
- ☐ > 40%

21. If answer to Q19 is yes, how would you rate the following aspects when purchasing a second hand phone? (Please rate each factor on a scale of 1-5, where 1 is least important and 5 is most important)

- ☐ Price
- ☐ Brand
- ☐ Better functions/features than existing phone
- ☐ Age and condition
- ☐ Background of phone seller
- ☐ Other (please specify) \_\_\_\_\_

22. How would you rate the following features based on frequency of use? (Please rate each factor on a scale of 1-5, where 1 is least used and 5 is most used)

- ☐ Calls
- ☐ Text/Instant messaging
- ☐ Camera
- ☐ E-mail
- ☐ Internet browsing
- ☐ Music
- ☐ Video
- ☐ Games
- ☐ Other (please specify) \_\_\_\_\_

23. How would you rate the following apps based on how frequently you used them? (Please rate each factor on a scale of 1-5, where 1 is least used and 5 is most used)

- ☐ Social networking
- ☐ Entertainment (Gaming, Music, Video)
- ☐ News and knowledge
- ☐ Maps and navigation
- ☐ Health and lifestyle
- ☐ E-commerce
- ☐ Other (please specify) \_\_\_\_\_

24. How much time (in minutes) do you spend on your mobile phone in a day on:

- ☐ Calls
- ☐ Chat/Instant messaging
- ☐ Social networking
- ☐ Games
- ☐ Music/Video
- ☐ News and knowledge
- ☐ Travel, maps and navigation
- ☐ E-commerce
- ☐ Internet browsing
- ☐ Other (please specify) \_\_\_\_\_

25. If you were to change your phone, would you be willing to change from the existing phone (model and brand) to another one (new brand or a completely different model within the same brand)

- ☐ Yes
- ☐ No

26. If answer to Q25 is no, is it mostly because you are:

- ☐ Familiar with the functionality of the current phone
- ☐ Other brands do not offer a similar phone in this price range
- ☐ Locked in with the existing devices and/or operating system
- ☐ Other (please specify) \_\_\_\_\_

27. If answer to Q25 is yes, it is mostly because:

- ☐ Other brands have better options in the same price range
- ☐ Looking for new experience and features in a device
- ☐ High cost of repair/service (or poor service experience)
- ☐ Other (please specify) \_\_\_\_\_

## Appendix 8

**Table A8.1: Monthly Income Distributed by Educational Qualification**

Educational Qualification	Monthly Income						No response
	< 30,000	30,000 -< 50,000	50,000 -< 1,00,000	1,00,000 -< 3,00,000	> 3,00,000	No income	
Mphil/PhD	2	1	3	1	0	1	0
Post Graduation	33	38	18	9	8	14	23
Graduation	71	25	21	10	4	32	92
Sr. Secondary (upto class 12)	8	3	3	0	1	58	34
Secondary (upto class 10)	8	4	1	1	1	4	12
Upper Primary (upto class 8)	0	0	0	0	0	0	0
Primary (upto class 5)	0	0	0	0	1	0	2

**Table A8.2: Monthly Income Distributed by Occupation**

Occupation	Monthly Income						No response
	< 30,000	30,000 -< 50,000	50,000 -< 1,00,000	1,00,000 -< 3,00,000	> 3,00,000	No income	
Employed with Private Sector	60	27	14	10	7	3	8
Employed with Public Sector	11	5	5	0	0	0	0
Employed with a Not-for-Profit Business	3	19	6	2	0	1	0
Independent Professional (Lawyer/Doctor)	6	1	3	2	0	14	0
Student	7	2	1	0	0	70	94

**Table A8.3: Monthly Income wise Number of Smartphone and Feature phone owners**

Monthly Income	Smartphone	Featurephone	Other	No response
< 30,000	117	5	0	0
30,000 -< 50,000	71	0	0	0
50,000 -< 1,00,000	44	2	0	0
1,00,000 -< 3,00,000	20	1	0	0
> 3,00,000	13	1	0	0
No income	105	1	Does not have a phone	1
Blank Response	158	4	Other	0



Table A8.4: Vendor-group wise Users and User Preferences

Vendor Group	Number of Users	Percentage share	Smart phones	Feature phones	Average Price	Most important factor while buying a mobile phone	Most important features
Acer	2	0.37%	2	0	10000	Operating system	Battery life, RAM and processing speed, storage memory, camera resolution, vernacular support, display resolution
Apple	56	10.29%	56	0	44981.11	Brand	Battery life
ASUS	8	1.47%	8	0	9000	Brand and Technology support (3G/4G support)	Battery life, RAM and processing speed, storage memory
Celkon	2	0.37%	2	0	5000	Brand, operating system and technology support (3G/4G support)	Battery life, screen size, vernacular support, audio quality
Coolpad	3	0.55%	3	0	7000	Price	Battery life, RAM and processing speed, storage memory, camera resolution, vernacular support, operating system, audio quality, display resolution
Gionee	1	0.18%	1	0	10000	Price and operating system	Storage memory, operating system, audio quality, display resolution
Google	5	0.92%	5	0	43400	Technology support (3G/4G support)	Battery life
HTC	10	1.84%	9	1	20666.67	Brand and Technology support (3G/4G support)	Screen size
Huawei	3	0.55%	2	1	10000	Price, brand, operating system and service centre accessibility	Screen size and vernacular support
InFocus	3	0.55%	3	0	8000	Price, brand, service centre accessibility, technology support (3G/4G support)	Battery life, RAM and processing speed, storage memory
InnJoo	1	0.18%	1	0	5000	Price, brand, operating system, service centre accessibility, technology support (3G/4G support)	Battery life, screen size, RAM and processing speed, storage memory, camera resolution, vernacular support, operating system, audio quality, display resolution
Intex	2	0.37%	1	1	6250	Technology support (3G/4G support)	Battery life, RAM and processing speed, storage memory, vernacular support, operating system, display resolution
Karbonn	2	0.37%	1	1	6500	Price, brand, operating system, technology support (3G/4G support)	Battery life, RAM and processing speed, storage memory, camera resolution, vernacular support, display resolution
Lava	1	0.18%	1	0	7500	Price and service centre accessibility	Battery life, audio quality and display resolution
LeEco	2	0.37%	1	1	Unreported	Technology support (3G/4G support)	Screen size
Lenovo	36	6.62%	33	3	10727.12	Technology support (3G/4G support)	RAM and processing speed
LG	7	1.29%	7	0	15750	Technology support (3G/4G support)	Camera resolution
Lyf	4	0.74%	4	0	6875	Brand	Battery life
Micromax	21	3.86%	20	1	9328.5	Technology support (3G/4G)	Storage memory

Vendor Group	Number of Users	Percentage share	Smart phones	Feature phones	Average Price	Most important factor while buying a mobile phone	Most important features
						support)	
Microsoft	1	0.18%	1	0	16000	Operating system, service centre accessibility, technology support (3G/4G support)	Battery life, RAM and processing speed, operating system, audio quality
Motorola	74	13.60%	74	0	12804.05	Technology support (3G/4G support)	Battery life
Nokia	5	0.92%	4	1	9550	Service centre accessibility	RAM and processing speed, storage memory, camera resolution, vernacular support, operating system, audio quality
OnePlus	20	3.68%	20	0	22692.15	Technology support (3G/4G support)	Storage memory and display resolution
OPPO	33	6.07%	32	1	14539.16	Brand	Battery life, RAM and processing speed, storage memory
Panasonic	3	0.55%	3	0	9500	Operating system and technology support (3G/4G support)	Battery life, camera resolution, vernacular support, operating system, display resolution
Samsung	109	20.04%	106	3	17094.49	Technology support (3G/4G support)	Battery life and storage memory
Sony	7	1.29%	7	0	21500	Operating system	Battery life
Videocon	1	0.18%	0	1	Unreported	Brand, service centre accessibility and technology support (3G/4G support)	Screen size, storage memory, vernacular support, audio quality
Vivo	24	4.41%	24	0	14127.22	Service centre accessibility	Camera resolution
Xiaomi	53	9.74%	53	0	11725.97	Technology support (3G/4G support)	RAM and processing speed
Others	1	0.18%	1	0	Unreported	Price, brand, service centre accessibility, technology support (3G/4G support)	Battery life, screen size, RAM and processing speed, storage memory, camera resolution, vernacular support, display resolution
No response	44	8.09%	42	Unreported	11428.57	Technology support (3G/4G support)	Storage memory and vernacular support

Source: All tables in Appendix 8 are based on data from the consumer survey





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